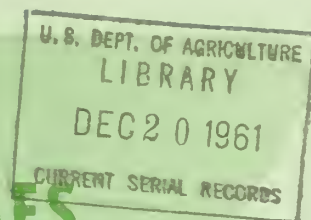


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How State MARKETING SERVICE AGENCIES Can Assist In REDUCING MARKETING COSTS

**A Report of the
National Marketing Service Workshop
at Peoria, Illinois
November 13-15, 1956**

**UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service**

in cooperation with

STATE DEPARTMENTS OF AGRICULTURE

Washington, D.C.

July 1957

AMS-195

PREFACE

State representation at the 1956 National Marketing Service Workshop in Peoria, Ill., was at a peak this year; 35 States and the U. S. Department of Agriculture sent a total of 134 delegates. The States with the largest representations were Georgia, Illinois, and Louisiana, each with 10 or more delegates at these meetings.

The 3-day workshop was devoted to finding ways by which State departments of agriculture can assist producers and marketing agencies in reducing costs of marketing. On the first day, emphasis was placed on reducing marketing costs by maintaining quality and preventing spoilage, deterioration, damage, and breakage of agricultural products. On the second day, attention was given to reducing costs by improving handling methods and equipment used throughout the marketing channels in getting products from the producer to the consumer. On the third day, discussions centered around ways of reducing costs by improving facilities for processing, storing, and distributing agricultural commodities. Each subject was opened by a general speaker with considerable experience and knowledge of his field.

Following these general presentations, five work groups met simultaneously each day, each giving its complete attention to a single commodity group. Thus, a total of 15 group sessions were held during the workshop. The five major commodity groups considered were: (1) Fruits and vegetables, (2) milk and dairy products, (3) poultry and eggs, (4) grain and seed, and (5) livestock and meats. Each work group meeting was opened with discussions by two specialists, who gave examples of work being done in the field related to the work group topic and the results achieved through these programs. The group then discussed the topic in detail and prepared conclusions and recommendations on what producers and marketing agencies can do to reduce marketing costs and how the State departments of agriculture can be of greatest assistance.

This report on the proceedings of the workshop presents the 39 speeches given during the meetings and the conclusions and recommendations reached by the 15 work groups. The plan of presentation is as follows:

1. The general speeches which opened the topic of the day.
2. For each commodity group, the two speeches which opened each work group session, followed by the conclusions and recommendations of the work group.
3. Speeches given at a special evening session on expanding market outlets for agricultural products.
4. A report on a question-and-answer period, during which questions asked by delegates from the States on operations of the matching-fund program were answered by members of the Liaison Office staff.

In reviewing the speeches, the Liaison Office took the privilege of making some modifications in them to attain uniformity and completeness in the presentation of the proceedings. It is hoped that these revisions do not in any way change the meaning intended by the speakers.

The Advisory Committee on Cooperative Work under the Agricultural Marketing Act met in Peoria on November 14 and 15 as the meetings of the National Marketing Service Workshop were in progress. At this meeting, the committee decided that another workshop should be held at about this time in the fall of 1957 at some central point in the United States.

Members of the Program Committee, who are listed below, express their appreciation and gratitude to the host State--Illinois--for the invitation to hold the 1956 workshop in that State and for all of the assistance given by the Illinois people in making this workshop a success even beyond the expectations of the Committee.

George H. Chick, Chief, Division of Markets, Main Department of Agriculture, Augusta, Maine

Donald E. Wilkinson, Chief, Markets Division, Wisconsin Department of Agriculture, Madison, Wis.

John A. Winfield, Director, Division of Markets, North Carolina Department of Agriculture, Raleigh, N. C.

William C. Crow, Liaison Officer, Matching Fund Program, State Departments of Agriculture, AMS, USDA, Washington, D. C.

L. G. Foster, R. P. Callaway, and E. C. Collins, of the Liaison Office, Matching Fund Program, State Departments of Agriculture, AMS, USDA, Washington, D. C.

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PROGRAM

1956 NATIONAL MARKETING SERVICE WORKSHOP

Theme: How State Marketing Service Agencies Can Assist in Reducing Marketing Costs

Time: November 13, 14, and 15, 1956

Place: Hotel Jefferson, Peoria, Ill.

Tuesday, November 13

9:00-10:15 a.m. OPENING SESSION

Chairman--Stillman J. Stanard, Director, Illinois Department of Agriculture

Invocation--Wesley W. Windisch, Chief, Bureau of Markets, Ohio Department of Agriculture

Plans for the Workshop--L. G. Foster, Liaison Office, Matching Fund Program, State Departments of Agriculture, AMS, USDA

Keynote Address--"The Marketing Bill: Its Components and Trends"--D. Barton DeLoach, Chief, Market Organization and Costs Branch, AMS, USDA

10:15-11:00 a.m. GENERAL SESSION

Chairman--George H. Chick, Chief, Division of Markets, Maine Department of Agriculture

"Where and How Reducing Spoilage and Deterioration in Agricultural Products Can Effect Savings in the Marketing Bill"--Wilbur T. Pentzer, Chief, Biological Sciences Branch, AMS, USDA

11:15 a.m.-
12:15 p.m. and
1:30-5:00 p.m.

MEETINGS OF FIRST WORK GROUPS

A. Reducing Costs of Marketing Fruits and Vegetables by Preventing Damage, Spoilage, and Deterioration

Chairman---James E. Youngblood, South Carolina
Secretary--R. P. Callaway, AMS, USDA
Speakers---Leon Scott, Mississippi
Gale R. Ammerman, Indiana

B. Reducing Costs of Marketing Milk and Dairy Products by Decreasing Losses in Quality

Chairman---O. H. Engendorff, Wyoming
Secretary--Louis F. Herrmann, AMS, USDA
Speakers---V. C. Manhart, Indiana
Harold O. Clark, Vermont

C. Reducing Costs of Marketing Poultry and Eggs by Maintaining Quality

Chairman---Robert L. Boswell, Georgia
Secretary--John A. Hamann, AMS, USDA
Speakers---James R. Harris, Illinois
Pyron Keener, Alabama

D. Reducing Costs of Marketing Grain and Seed by Minimizing Deterioration and Contamination

Chairman---John E. Mahoney, Maryland
Secretary--E. C. Collins, AMS, USDA
Speakers---Mark D. Worcester, South Dakota (grain)
D. D. Hill, Oregon State College (seed)

E. Reducing Costs of Marketing Livestock and Meats by Preventing Losses and Deterioration

Chairman--Justin Doak, Missouri
Secretary--S. T. Warrington, AMS, USDA
Speakers---Robert J. Norrish, Livestock Department,
Armour & Co.
Amos R. Meyer, Maryland

7:30-9:00 p.m.

GENERAL SESSION ON EXPANDING MARKET OUTLETS

Chairman--William C. Lynn, Assistant Secretary, New Jersey
Department of Agriculture

"Promotional Programs for Agricultural Products"--Kenneth D. Naden, National Association of Food Chains, Washington, D. C.

"The Wisconsin Cheese Promotion Program"--Donald E. Wilkinson, Chief, Markets Division, Wisconsin Department of Agriculture

"Expanding Markets for Maine Potatoes"--William P. Charron, Assistant Chief, Division of Markets, Maine Department of Agriculture

"Organizing State and Local Agencies and Marketing Firms in Carrying Out an Integrated Promotion Program"--Raymond B. Wilson, Agricultural Economics Department, Purdue University

Discussions

9:00 p.m. "Food Distribution in Europe" (with a series of slides of European food markets)--Raymond W. Hoecker, Transportation and Facilities Branch, AMS, USDA

Wednesday, November 14

8:30-9:15 a.m. GENERAL SESSION

Chairman--C. J. Carey, Deputy Director, California Department of Agriculture

"How Marketing Costs Can Be Reduced by Use of More Efficient Handling Methods and Equipment"--William H. Elliott, Transportation and Facilities Branch, AMS, USDA

9:30-12:00
noon

MEETINGS OF SECOND WORK GROUPS

A. Reducing Costs of Marketing Fresh and Processed Fruits and Vegetables by Improving Handling Methods and Equipment

Chairman---C. Harold Bray, Kentucky
Secretary--R. P. Callaway, AMS, USDA
Speakers---William H. Elliott, AMS, USDA
Nelson D. Howard, Maryland

B. Reducing Costs of Marketing Milk and Dairy Products by Improving Handling Methods and Equipment

Chairman---Harvey J. Weavers, Wisconsin
Secretary--Louis F. Herrmann, AMS, USDA
Speakers---Richard Hoyt, National Milk Producers Federation, Washington, D. C.
Donald E. Hirsch, FCS, USDA

C. Reducing Costs of Marketing Poultry and Eggs by Improving Handling Methods and Equipment

Chairman---Marvin A. Faller, Louisiana
Secretary--John A. Hamann, AMS, USDA
Speakers---John A. Hamann, AMS, USDA
R. J. Park, Tennessee

D. Reducing Costs of Marketing Grain and Seed by Improving Handling Methods and Equipment

Chairman---Ollie W. Faison, North Carolina
Secretary--E. C. Collins, AMS, USDA
Speakers---Carl H. Witham, Farmers' Cooperative Commission
Co., Hutchinson, Kansas (grain)
W. K. Farris, Jr., Alabama (seed)

E. Reducing Costs of Marketing Livestock and Meats by Improving Handling Methods and Equipment

Chairman---Clifton B. Cox, Indiana
Secretary--S. T. Warrington, AMS, USDA
Speakers---George E. Turner, AMS, USDA (livestock)
Raymond W. Hoecker, AMS, USDA (meats)

1:30-2:30 p.m. GENERAL SESSION

Chairman--Charles F. Shelnut, Assistant Commissioner,
Massachusetts Department of Agriculture

"Opportunities for Reducing Marketing Costs Through More Efficient Wholesaling and Retailing"--Raymond W. Hoecker, Transportation and Facilities Branch, AMS, USDA

2:45-5:00 p.m. MEETINGS OF SECOND WORK GROUPS (continuation)

6:30 p.m. BANQUET

Toastmaster--L. Y. Ballentine, Commissioner, North Carolina
Department of Agriculture

Entertainment from Bradley University

"The Role of Public Agencies in Improving the Marketing of Farm and Food Products"--Oris V. Wells, Administrator, AMS, USDA

Thursday, November 15

8:30-9:15 a.m. GENERAL SESSION

Chairman--Paul W. Swisher, Commissioner, Colorado Department of Agriculture

"Reducing Marketing Costs Through Modernization of Facilities"--
James E. Youngblood, Director, South Carolina State Agricultural Marketing Commission

9:30-12:00

noon and

1:30-2:30 p.m. MEETINGS OF THIRD WORK GROUPS

A. Reducing Costs of Marketing Fruits and Vegetables by Improving Processing and Distribution Facilities

Chairman---Davis Foreman, Illinois

Secretary--R. P. Callaway, AMS, USDA

Speakers---Hugh B. Martin, North Carolina

Harold L. Link, Food Machinery and Chemical Corporation, Hoopeston, Ill.

B. Reducing Costs of Marketing Milk and Dairy Products by Improving Facilities for Processing and Distribution

Chairman---J. Ray Brignac, Louisiana

Secretary--Louis F. Herrmann, AMS, USDA

Speakers---Thomas A. McMaster, Montana

Harvey J. Weavers, Wisconsin

C. Reducing Costs of Marketing Poultry and Eggs by Modernizing Distribution Facilities

Chairman---James Petr, Kansas

Secretary--John A. Hamann, AMS, USDA

Speakers---Ralph B. Kelly, North Carolina

Tom Fox, Oklahoma

D. Reducing Costs of Marketing Grain by Improving Distribution and Storage Facilities

Chairman---John A. Winfield, North Carolina

Secretary--E. C. Collins, AMS, USDA

Speakers---William L. James, Jr., Virginia

W. S. Farris, Indiana

E. Reducing Costs of Marketing Livestock and Meats by Improving
Distribution Facilities

Chairman---Paul T. Rowell, Oregon

Secretary--S. T. Warrington, AMS, USDA

Speakers---W. Richard Cummins, Producers Marketing
Association, Indianapolis, Ind.

S. T. Warrington, AMS, USDA

2:30-5:00 p.m. GENERAL SESSION

Chairman--Math Dahl, Director, North Dakota Department of
Agriculture and Labor

Questions and Answers on the Matching Fund Marketing Service
Program

Presentation of Work Group Reports, by Commodity Groups

Concluding Remarks--William C. Crow, Liaison Officer, Matching
Fund Program, State Departments of Agriculture, AMS, USDA

Adjournment

PLANS FOR THE WORKSHOP

L. G. Foster, Liaison Office,
State Departments of Agriculture,
Agricultural Marketing Service, USDA

Ten years have elapsed since the passage of the Agricultural Marketing Act of 1946. During the early years of the program, workshops were held on an area basis so that marketing service personnel of the States within each area could meet to discuss marketing problems existing in the area, outline plans for solving them, and exchange views as to the best ways to accomplish the objectives. At these meetings a functional approach was taken in the consideration of these problems, regardless of the commodity involved.

In 1952, an attempt was made to change the pattern of the workshops. In that year, two meetings were held--one in St. Louis, the other in Baltimore--and the problems were attacked on a commodity basis. The venture was not too successful in St. Louis; however, the Baltimore conference met with sufficient success and approval that the establishment of a workshop on a national basis was warranted.

Since that time, 7 additional States have entered the matched-fund program so that it is now possible to have better representation in a number of work groups, with discussions in each group devoted to a major agricultural product. With the guidance and suggestions of the Advisory Committee on Cooperative Work and the excellent participation of most States, workshop programs have developed to the point where they are planned around a theme, and discussions are limited to specific problems within the area of the central theme.

The theme this year is: "How State Marketing Service Agencies Can Assist in Reducing Marketing Costs." The program emphasizes the pressing need for reducing costs of marketing wherever possible. This workshop, like previous ones, is being held at the direction of the Advisory Committee representing the State departments of agriculture, and the program was planned largely by representatives of the States. Therefore, this is your workshop, and the subjects that will be discussed during the next 3 days are ones in which your States are, or should be, interested.

More specifically, the purpose of the program is to discuss three ways by which State departments of agriculture can assist producers and marketing agencies in reducing costs of marketing: (1) By minimizing losses due to spoilage, deterioration, damage, breakage, or bruising; (2) by improving handling methods and equipment; and (3) by improving facilities for processing, storage, and distribution. In these discussions five major commodity groups will be considered: (1) Fruits and vegetables, (2) milk and dairy products, (3) poultry and eggs, (4) grain and seed, and (5) livestock and meats.

The basic pattern of recent workshops is being followed again this year. The topic of the day will be introduced in a general session, to be attended by all of you. The speeches given in the general sessions will serve as a

guide to the work group discussions that will follow. Each day, five work groups will meet simultaneously, each one giving its undivided attention to a single commodity group. Each person attending the workshop should select work groups that will assist him most in his work. At each work group session, two speakers will introduce the subject in 20-minute discussions of the problems under consideration by giving research results or the best known ways to accomplish the objectives. Panel members will be expected to participate in subsequent discussions and help reach conclusions as to the best contribution marketing service people can make to solve each problem. These conclusions will be presented by the chairmen of the groups at the closing general session on the third day of the workshop. The reports of the 15 work groups and the speeches will be published in the proceedings of the workshop, which will be sent to each person attending the conference.

A general session on the first evening of the workshop will consist of a panel discussion on expanding market outlets for agricultural products. The second night will feature a banquet; entertainment by students from a local university; and an address by Oris V. Wells, Administrator of the Agricultural Marketing Service.

The workshop was planned with the thought that it would help to bring about improvements in marketing service programs in the 41 States and Territories carrying on activities under these programs. If each of you will do your part by participating in this conference with the idea that this is a place for hard WORK and that nothing will take the place of WORK, you will be inspired with many ideas that are worth putting to WORK back in your State. It is up to you, therefore, to make the most of the potential benefits offered by this workshop.

THE MARKETING BILL: ITS COMPONENTS AND TRENDS

D. Barton DeLoach
Market Organization and Costs Branch
Agricultural Marketing Service, USDA

The term, "Marketing Bill for Farm Food Products," has become a shorthand method of expressing the total payments for processing, storing, transporting, wholesaling, retailing, and other marketing services. The term appeals to some segments of agriculture because it provides a handy index of changes in marketing costs to compare with prices farmers receive. Like all indexes it has a degree of usefulness; however, it so frequently is misused that its value as a working tool has been greatly impaired.

In an effort to make available as complete a statistical service as possible, the U. S. Department of Agriculture has constructed a number of economic indexes. These indexes provide farmers and businessmen with information on trends and the current status of many factors that they require to reach decisions regarding the production and marketing of food. The premise for maintaining a flow of economic statistics is a simple and a practical one:

That knowledge of the past is a guide to the future, and the established relationships among various economic, physical, and biological phenomena are discernible and measurable. Recognition is accorded the interplay of economic forces that goes on continuously, and an effort is made to provide the basic facts to help farmers and businessmen anticipate changes and the magnitude of changes in our economy and the causes therefor. In this respect, the marketing information provided by the Department, like most of its economic information releases, gives the economic environment in which farmers or businessmen must operate. If they understand the problems outside their individual enterprises, then their task is that of an intra-firm activity within the framework of the general economic setting.

The Department's "Marketing Bill for Farm Food Products," when combined with production and marketing statistics, shows three facts: (1) A rapidly rising price level; (2) an expanding volume of marketings; and (3) a threefold increase in the marketing bill since 1941, with a similar increase in labor costs, transportation, and other costs and profits--the components of the marketing bill.

The upward trend in the "bill" is attributable to a higher price level, additional marketing services, and a greater volume of marketings. Recently an effort was made to approximate the reasons for the rise in marketing costs, in USDA Miscellaneous Publication No. 708, "Marketing Costs for Food." This report stated that "Several factors accounted for the 23-billion-dollar increase in the marketing bill from 1940 to 1955. The volume of food marketed increased during this period by more than 40 percent. This increase would raise the 9-billion-dollar bill at the 1940 cost level to about 13 billion dollars. At the 1955 cost level, the bill for marketing this volume of food would amount to 26 billion dollars. With the general rise in all prices and costs since 1940, charges for performing marketing operations roughly doubled. The remaining 6 billion dollars of the increase represents payments consumers are making for new marketing services which have been added since 1940. The value of added services is measured at current cost levels. However, improved efficiency in processing and distributing food products between 1940 and 1955 has meant that some additional marketing services could be provided without adding to the total marketing bill." 1/

The claims of many people that our food marketing system is inefficient cannot be substantiated. In a relative sense, American businessmen have developed an extremely efficient system for moving farm products to consumers through the various processing and distributive outlets that are necessary to perform the services needed. Furthermore, this marketing system has made possible a broadening of the markets for perishable farm products, a high degree of specialization in agriculture, and a higher plane of living for the American people. The efficiency of the present system is due mainly to the

1/ The marketing bill data in table 1 include all charges for marketing farm-produced food products from the farm to the consumer, except service charges for food sold in the form of meals in restaurants and other eating places. The increase of 23 billion dollars referred to above was derived from estimates of the marketing bill that included these additional service charges.

Table 1.--The national marketing bill for farm food products: Labor, transportation, and other charges from time of sale by farm producers to time of purchase at retail by United States civilian consumers, 1929-55 1/

| Year | Total marketing bill | Labor cost | Trans- portation | Other costs and profits |
|----------------------|----------------------------|--------------------|---------------------|-------------------------------|
| | Billion dollars | Billion dollars | Billion dollars | Billion dollars |
| 1929 | 9.9 | 3.8 | 1.0 | 5.1 |
| 1930 | 9.8 | 3.7 | 1.0 | 5.1 |
| 1931 | 8.4 | 3.4 | 1.0 | 4.0 |
| 1932 | 7.2 | 2.9 | .9 | 3.4 |
| 1933 | 7.3 | 2.7 | .8 | 3.8 |
| 1934 | 7.9 | 3.0 | .8 | 4.1 |
| 1935 | 7.6 | 3.1 | .8 | 3.7 |
| 1936 | 8.5 | 3.3 | .8 | 4.4 |
| 1937 | 8.2 | 3.6 | .9 | 3.7 |
| 1938 | 8.2 | 3.6 | .9 | 3.7 |
| 1939 | 8.2 | 3.7 | 1.0 | 3.5 |
| 1935-39 average..... | 8.1 | 3.4 | .9 | 3.8 |
| 1940 | 8.5 | 3.9 | 1.0 | 3.6 |
| 1941 | 9.2 | 4.1 | 1.2 | 3.9 |
| 1942 | 10.5 | 4.5 | 1.0 | 5.0 |
| 1943 | 11.1 | 4.6 | 1.0 | 5.5 |
| 1944 | 11.4 | 5.0 | 1.1 | 5.3 |
| 1945 | 12.5 | 5.5 | 1.3 | 5.7 |
| 1946 | 15.6 | 6.7 | 1.6 | 7.3 |
| 1947 | 17.7 | 7.9 | 2.0 | 7.8 |
| 1948 | 19.7 | 8.9 | 2.2 | 8.6 |
| 1949 | 20.7 | 9.4 | 2.4 | 8.9 |
| 1947-49 average..... | 19.4 | 8.7 | 2.2 | 8.5 |
| 1950 | 21.2 | 9.9 | 2.6 | 8.7 |
| 1951 | 22.8 | 10.6 | 2.6 | 9.6 |
| 1952 | 24.4 | 11.4 | 3.0 | 10.0 |
| 1953 | 25.6 | 12.1 | 3.0 | 10.5 |
| 1954 <u>2/</u> | 26.5 | 12.6 | 3.3 | 10.6 |
| 1955 <u>2/</u> | 27.9 | 13.0 | 3.6 | 11.3 |

1/ Data published annually in "The Marketing and Transportation Situation."

2/ Preliminary estimates.

willingness of most marketing people to accept technological changes in their stride and to adapt their marketing practices to new conditions. Although there is some inertia in the system caused by marketing agencies, property owners, and workers who are trying to protect their vested rights, the efficiency of marketing has been improved gradually. Because of the willingness of most market operators and processors to accept change, there is a golden opportunity for research workers to point the direction for further improvement in marketing efficiency by making economic, physical, and biological research findings available to the public. Likewise, the agricultural extension services and the State departments of agriculture should carry these research findings to the people who can use them. These groups have an unusual opportunity to help develop a better system for marketing farm products.

Frankly, I am not alarmed about the rising marketing costs, because they are rising at a slightly lower rate than disposable income. I am concerned about the inertia that prevents a more rapid improvement in the efficiency of marketing which could reduce costs or improve services. It is in this area that the people in the State departments of agriculture, the State experiment stations, and the U. S. Department of Agriculture should concentrate their energies. Obsolete marketing practices and facilities and wasteful restrictions imposed by owners of capital, labor, and public agencies tend to dissipate our resources and raise costs.

You have asked me to indicate the direction of marketing costs for the near future. My answer is that marketing costs are likely to rise. Furthermore, this implies that the sale of marketing services, along with food, will become increasingly important. Although this may mean that the farmer's share of the consumer's dollar may decline, the actual monetary return to the farmer could be greater than now.

WHERE AND HOW REDUCING SPOILAGE AND DETERIORATION IN
AGRICULTURAL PRODUCTS CAN EFFECT SAVINGS IN MARKETING

W. T. Pentzer
Biological Sciences Branch
Agricultural Marketing Service, USDA

The subject of this paper is spoilage and deterioration of agricultural products in marketing channels. Where the losses take place and how they can be prevented are important aspects of the problem. What do spoilage losses amount to, and are they worth talking about?

According to recent estimates, losses from diseases, insects, weather, and other hazards, during production amount to over 9 billion dollars annually, or 22.6 percent of the potential production. 2/ Losses during

2/ Losses in Agriculture - A Preliminary Appraisal for Review.
Agricultural Research Service, U. S. Department of Agriculture, in cooperation with other Department and Federal agencies. June 1954.

marketing were 3.8 billion dollars and were equivalent to 9.4 percent of total production. These losses are equivalent to the amount of food produced on 32,238,000 acres of crop land and 126,441,000 acres of pasture and range. It seems incredible that about 32 percent of our potential production of agricultural crops is lost before it reaches the consumer, but that is what these estimates say.

Examples of Losses and Their Causes

Some specific examples of heavy losses occurring in shipments of fruits and vegetables about which the Department has firsthand knowledge are given below.

Sweetpotatoes. The first is a truckload of New Jersey sweetpotatoes that arrived in Chicago with 20 to 80 percent of the roots affected with pythium rot, averaging 45 percent decay. The sweetpotatoes were considered to be in good condition when they were shipped. What was the cause of the trouble? The driver reported on questioning that a long, cold rain occurred just prior to harvesting the crop. Wet soil, leading to infection, was the most likely contributing factor. Harvesting before the wet weather, or delaying digging until the soil had dried, would have helped in this case. Poor curing practices may also have contributed to the heavy loss.

Strawberries. A second case was a carload of Kentucky strawberries that arrived in Denver, Colo., with some crates of berries showing 20 to 30 percent decay from leather rot. This rot is caused by an organism thriving in certain shipping areas during warm, rainy weather. It takes about 3 days after the rain for the rot to appear on the fruit. The rot becomes the heaviest in 4 or 5 days and will disappear from the fields in 7 or 8 days if the weather remains dry. If shipments are precooled to 35° to 40° F. and are kept below 40° in transit, this rot can be held in check for 4 or 5 days, long enough for fruit to reach nearby markets.

Lettuce. A third case of heavy loss involved 11 carloads of California lettuce that arrived in Chicago averaging 29 percent decay, identified as watery soft rot due to a fungus known as Sclerotinia. This was not the usual bacterial soft rot so commonly found on leafy vegetables. When the receiver reported this condition to the shipper, he could not understand how so much decay could have developed. The identification of the disease causing the trouble was the key to solving the problem. Sclerotinia is a soil organism, pointing to a field infection. The lettuce had been trimmed very little and was shipped by dry pack. The advice to the producer was to trim off the infected outer leaves that were in contact with the soil and to ship the balance of the crop with package ice to insure prompt and adequate refrigeration.

Tomatoes. Losses on tomato shipments are most likely to occur if they are in transit a long time, such as on shipments from California or Mexico to the Atlantic Coast. For instance, one Canadian receiver reported to the Department that he experienced 13 to 70 percent decay when he tried to ripen California tomatoes that had been iced too heavily in cool fall weather.

A considerable number of carloads of Mexican tomatoes suffered great losses several years ago during a shortage of railroad motive power. These cars moved under refrigeration from the production area in Mexico to the border at Nogales, Ariz., where they were iced and held on track for about a week waiting to be moved. The tomatoes looked good when inspected at the border, and they still looked fresh and green as they passed through Chicago, as well as upon arrival in Washington, D. C., some 18 to 21 days after starting their long journey under refrigeration. The buyer in Washington, D. C., called one of our specialists in to look at the tomatoes several days after they had been put in the ripening room. Almost all of them were developing an abundant growth of alternaria rot. The loss was more than 50 percent at a delivered price of more than \$5 a lug. The cause was chilling injury brought on by too long a time at temperatures below 55° F. Our advice today is not to hold mature green tomatoes at temperatures below 55°. In other words, the ripening of green tomatoes should not be stopped completely by refrigeration. Receivers who are still trying it usually pay for it. A carload of Florida tomatoes shipped last December to Philadelphia was held on track for 2 weeks during cool weather while the receiver was hoping for a rise in the market. Heaters were put in the car to prevent freezing, but no attention was given to the danger of chilling by nonfreezing temperatures. The receiver wanted to sue the railroad for damage for which he was responsible by speculating with a temperamental commodity.

Much needs to be done on quality improvement of tomatoes offered for sale in retail stores. Some suggestions for cutting down spoilage losses and improving quality in the mature green tomato crop are: (1) Pick them mature. (2) Ship at temperatures of 55° to 65°. A mature green tomato will need 8 to 10 days to ripen at 65°, so there is little excuse to ship at lower temperatures except for long-distance shipments. (3) Ripen at 65° to a full red color. Reluctance of retailers to handle a full red tomato is responsible for the tough pink product that has no flavor and is disappointing to the purchaser. The pink tomato offers some hope of better quality, but a better job of ripening and merchandising the much bigger mature green crop needs to be done.

Squash. Some other commodities are damaged by too much refrigeration. A carload of acorn squash shipped from Texas to Washington, D. C., developed alternaria rot on about 85 percent of the squash after a few days on the market. Chilling injury damaged the squash, allowing the rot to develop. The squash probably had been held in storage or was in transit under refrigeration for a long time, perhaps 3 weeks or longer, for it takes this much time to damage squash.

Watermelons. Growers in a certain area that had shipped 175 carloads of watermelons had to stop harvesting the crop because of extensive decay that developed in transit, on track, and in stores. No serious visible decay was reported in the fields, and only slight decay was noted on arrival at nearby markets. However, by the time the melons were sold and reached the stores, more than half were rotted. Had this decay been properly diagnosed as stem end rot earlier in the season, treatment with copper sulphate paste could have saved practically all of the melons and permitted the continued harvesting of

the crop throughout the normal season. Undoubtedly the causal fungus will be present in the same watermelon fields next season, but by knowing the control measures to apply, thousands of sound melons can be shipped with little loss to the growers, shippers, transportation companies, dealers, or consumers.

Miscellaneous fruits and vegetables. The Department's pathologist stationed in the New York market reported a carload of Washington potatoes showing 25 percent damage from bruising, a shipment of California lettuce with 30 percent tipburn, Washington apples showing 13 percent of the fruit affected with Bulls-eye rot, a carload of California nectarines with 100 percent damage from sulfur dioxide fumigation (intended for grapes but given to nectarines by mistake), and Washington peaches showing 12 percent bruising. As shown by these examples, there are still many problems in connection with growing high-quality products, handling them with proper care, understanding what their refrigeration needs are, and getting them to consumers in an attractive edible condition.

Meat, poultry, and eggs. Meat packers suffer losses from slime and mold on carcasses during shipment, retail cuts of luncheon meats go bad quickly, and consumer displays of cut-up packaged meat have relatively short shelf life. Poultry experts report that bacteria multiplication in cut-up poultry goes on at a terrific rate, ending in spoilage in 4 or 5 days even at temperatures of 45° F. The antibiotic aureomycin will add several days of shelf life, but refrigeration still must be relied on for keeping poultry and meat fresh and wholesome. Bruising in the handling of live poultry is a serious cause of quality loss and down-grading.

Eggs are another perishable crop. Goresline, in his chapter on food spoilage and deterioration in Handbook of Food and Agriculture, 3/ cites figures that show 21 percent of the 2½-billion-dollar crop of eggs is lost through physical damage, quality deterioration, and spoilage. The largest loss is from quality deterioration brought on by physical and chemical changes in the eggs, which result in thinning of the white and migration of moisture into the yolk. Deterioration of the egg begins as soon as it is laid, and refrigeration is needed to preserve maximum quality. Cooling eggs to temperatures below 60° F. will help to preserve quality, and for long storage 29° is recommended. Spoilage of eggs by bacterial rotting and internal molding makes worthless about 5 percent of the production and represents a loss valued at \$125,000,000 annually.

Cereal crops. Some of the staple crops such as wheat, corn, and rice suffer heavy damage from insects during storage. Loss of wheat in the Great Plains region may be as high as 10 percent in one season's storage. Corn stored in the Deep South may be destroyed at a rate as high as 9 percent a month by insects. Some insects devour at least their own weight in a week. Molds, bacteria, and rodents are also responsible for serious damage to grain in storage.

3/ Handbook of Food and Agriculture. Fred C. Blanck. Reinhold Publishing Corporation. 1955.

Milk. In getting milk from the farm to the consumer, losses in quality and wholesomeness occur. In the dairy industry, the virtues of sanitation and refrigeration are widely recognized. It would be hard to find a medium better than milk for the growth of bacteria. The Refrigerating Data Book 4/ shows that a temperature of 32° F. holds bacteria growth to 2,400 per ml. in 24 hours, 50° F. holds the count to 11,600, whereas at 86° F. bacteria multiplied to the astronomical figure of 1,400,000,000 bacteria per ml. Does anyone need to be convinced that refrigeration is necessary for milk? Some of our people on the inspection side of dairy work have told me of the counts in milk delivered to plants for making dried milk. Some of these counts are 60,000,000 or more per ml., and temperatures of 80° F. or higher in the raw milk are encountered. There seems to be a correlation between high bacteria count in the final product and that of the raw milk. Pasteurization temperatures, of course, will kill bacteria, but sanitation and refrigeration also are needed to assure a good, wholesome product.

Conclusions

My conclusions regarding the prevention of spoilage and deterioration in agricultural products are that the know-how is there, but an effort has to be made to apply this knowledge where and where it is needed. The greatest need is for more extension work--getting people to change faulty practices. Four steps to a program for reducing losses from spoilage and deterioration are:

1. Identify the cause.
2. Apply the remedy.
3. Follow up with an appraisal of results.
4. Modify the remedy to fit the case.

Some of the important areas needing additional attention are:

1. Producers and marketing agencies must become better informed on the refrigeration requirements of the commodities with which they deal. For fruits and vegetables, USDA Handbook 66 is a good guide. For a general reference, The Refrigerating Data Book, published by the American Society of Refrigerating Engineers, is good. Many State bulletins are available on specific commodities. Some fruits and vegetables can be chilled. As a general rule, perishables need to be cooled to about 40° as soon as possible to get good quality control.

2. The prevention of spoilage must begin in the orchard, in the field, or on the farm. Damage from poor production practices cannot be undone in the marketing channel.

3. Mechanical damage is probably the most important single hazard a perishable crop meets as it goes to market. Take a close look at the next

4/ Refrigerating Data Book. American Society of Refrigerating Engineers. Applications Volume, Chapter 10, 4th Edition, pp. 10-01-08. 1952.

potatoes you buy. You could help to show packinghouse operators that jamming produce into a container to get a bulge pack is a poor way to handle it, that dropping a fruit or vegetable even 6 inches is likely to damage it, and that the whole process of handling perishables needs to be reviewed critically to take out the unnecessary bumps.

4. Infections can be prevented by sanitation practices and by the use of bactericidal and fungicidal washes and other treatments. Fumigants and sprays are potent weapons against insect damage.

5. There is no substitute for speed in handling perishable crops. If they cannot be handled fast enough, then it is better to freeze or can them. But the possibility of marketing fresh produce must not be underrated. Fast refrigerated trucks and direct delivery to refrigerated display cases in retail stores offer possibilities that were not available a few years ago.

There is an important job to be done. Nobody can make a lasting gain out of products that spoil in the hands of the consumer, the retailer, or the wholesaler. There is no one single solution to the problem, as, for instance, irradiation or a magic chemical. The greatest improvements will be made through education--by showing producers, processors, packers, shippers, wholesalers, warehousemen, retailers or any other persons or agencies concerned with the marketing of agricultural products where and how they can change their methods of handling to reduce the losses from spoilage and deterioration.

HOW MARKETING COSTS CAN BE REDUCED BY USE OF MORE EFFICIENT HANDLING METHODS AND EQUIPMENT

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The 1957 Outlook Issue of the Marketing and Transportation Situation estimates that in 1956 producers will receive only 40 cents of the consumer's retail food dollar. The remaining 60 cents, which is absorbed by marketing (including transportation) costs and margins will aggregate an estimated 29.0 billion dollars in 1956 (not including cotton and tobacco). This amount is an increase of 4 percent over 1955. The July issue of the Situation states that "Labor costs made up 47 percent of the marketing bill for farm food products in 1955." Because of increases in minimum wage rates and an increase in the volume of products marketed, there is no reason to believe labor costs will decrease in 1956. However, if the 1955 percentage is applied against this year's total farm food marketing costs, the total labor bill will approximate 13.6 billion dollars. Although this amount does not include the labor employed in cotton warehouses, textile plants, tobacco warehouses, and tobacco product manufacturing plants, it represents a substantial part of the gross national product.

The greater part of this labor is employed in the handling work involved in moving products through marketing channels, including moving them into, within, and out of marketing and storage structures, and in the preparation of these products for market. Although I do not contend that we can, or will, reduce total marketing costs or the total cost of labor employed by marketing firms, I definitely feel that we can reduce "unit" costs.

Because labor costs are the largest single item in the total food marketing bill, it appears logical that we should concentrate our efforts, and our discussion today, on ways and means of reducing these costs. The results of our research definitely show that costs per unit of product handled can be reduced by increasing the productivity of labor employed. Although we, as agricultural marketing workers, may not wish to become involved in matters involving the terms and conditions under which labor is employed, there are other means by which marketing service people, through the aid they can provide individual firms, can make a real contribution to increased labor productivity. I should like to discuss with you what might be considered as a 4-point program.

1. Reducing the amount of handling required in the marketing and storage of products.

One of the "sure-fire" ways of reducing handling costs is to reduce the amount of handling required for: (1) Moving products into, within, and out of the facilities through which they must move enroute from the producer to the consumer, and (2) quality maintenance. It is estimated that a box of apples is handled 25 to 30 times from the time it leaves the orchard until the consumer leaves the retail store with the fruit.

In addition, in many of the facilities through which products move, there are many out-of-line and back hauls that add to transport distances and to consequent labor and equipment costs. The need for carting products from team tracks to stores and warehouses without direct rail connections also adds to the number of times products are handled. Other practices and situations that unnecessarily increase the number of times products are handled in moving them through marketing channels could be cited. But improved facilities, which is another day's topic, hold as much or more promise in this area than do more efficient work methods and equipment.

However, in handling for quality maintenance, particularly in storages, we are finding through research that a great deal can be done to reduce this work by more efficient methods and equipment. As you know, in commercial elevators grain is turned from one silo or bin to another to cool the product, permit fumigation for insects, and mix for the purpose of equalizing temperatures and moisture. Mechanical aeration systems which move air through the grain offer promise of drastically reducing or, in some situations, of eliminating the need for moving grain through the air, or turning it, to maintain product quality. The results of our research to date indicate that a saving of roughly 40 percent can be made in the costs of turning grain by substituting aeration. Moreover, in none of our tests during the past two seasons has the aerated grain deteriorated in quality or had storage odors associated with grain that was turned.

2. Minimizing unproductive time on the part of labor employed.

Work sampling studies made in a number of selected Washington State apple packing and storage houses a few years ago showed that up to 50 percent of the time of labor employed for moving fruit into, within, and out of these houses was wasted because the workers either were idle or were doing unproductive tasks. Observations in other kinds of marketing and storage plants indicate that this situation is not confined to apple houses.

In apple houses where this upper limit of 50 percent prevailed, productive work was costing the plant exactly twice the amount of its average wage rate. Stated differently, if the plant could have completely eliminated idle time and unproductive efforts on the part of its workers (which we know it could not do), it theoretically might have been possible for the plant to reduce by one-half the total number of workers employed for the operations mentioned.

Although it is recognized that even the most efficient management cannot completely eliminate idle and unproductive time on a plantwide basis; minimizing this wasted time and effort is the cornerstone of methods improvement work. This probably is one reason that industrial engineers, who usually are associated with methods improvement research, formerly were referred to as "efficiency experts."

From the viewpoint of labor efficiency, the improvement of a work method in which no change in the type of equipment is contemplated boils down to a proposition of minimizing idle time caused by delays, waiting for work, and other causes. Obviously, work methods also can be improved by substituting more efficient equipment for that now in use. In some cases methods improvement may involve a reduction of the elapsed time required for performing an operation, such as getting frozen food into storage, but this "speed-up" usually is for the purpose of maintaining product quality rather than for achieving labor efficiency.

Because you marketing service people are concerned with ways and means of helping individual plants to reduce handling and other marketing costs, and because handling costs are affected by wasted labor time, I believe you should be familiar with the various classes of unproductive time and know where to look for them. Therefore, at the risk of getting a little too technical, I shall discuss briefly the six classes of unproductive time.

- a. Crew interference results in idle or wait time when several workers engaged in a common operation, such as hand truckers, interfere with, or get in the way of, each other because of narrow aisles, small and congested platforms, or other reasons. When two hand truckers meet in an aisle that is too narrow, one trucker must "pull up" and get out of the way to permit the other to proceed on his way. The time lost in pulling up and standing by is crew interference resulting from improperly designed facilities or poor management practices.

- b. Machine-regulated wait time occurs when a machine or group of machines, such as a fruit packingline, being operated at full capacity and requiring constant attendance, fails to provide sufficient productive work to keep the attendant(s) fully occupied. Suppose the packing line has a full capacity of 100 loose boxes of fruit per hour but the worker who hand trucks fruit from storage to the dumping station can, at a normal rate, move 200 boxes per hour. Because a constant supply of fruit is required at the dumping station, approximately one-half of the hand trucker's time is wasted through machine-regulated wait time.
- c. Crew imbalance wait time occurs when various members of a crew performing a group of operations that are tied together in a sequence do the productive work assigned at different rates or in different elapsed times. A 4-man crew unloading and placing in storage a carload of produce by 2-wheel hand trucks will serve to illustrate. In this crew, one man in the car loads 2 hand trucks, 2 men hand truck, and one man in the warehouse stacks. Less elapsed time is required to load the hand trucks and to stack the produce than is required for two men to transport between these points. As a consequence, wait time in the car and at the stacking point results.
- d. A similar type of wait time occurs when there is an imbalance in the productive rates, or rates of output, of two crews whose respective operations are tied together in a direct sequence. Most of you probably have seen the box ladder (one-man crew) who operates a lidding machine in a fruit packinghouse waiting for packed boxes of fruit to move to his work station from a crew of as many as 8 or 10 packers.
- e. Job-regulated wait time results from an irregular flow of work or products. The receiving crew on a livestock auction market frequently is idle near the end of a sale because truck arrivals then are irregular and may be infrequent. However, the crew usually cannot be reassigned to other work until the sale or receiving period is over.
- f. Changing jobs is the final class of unproductive time. It is not directly associated with work methods employed.

There are many ways of reducing unproductive time--and labor--costs without changing the type of equipment used in a method. These include: (1) Changing the crew size, (2) changing the amount of equipment used, (3) changing the assignments of individual crew members, (4) breaking the direct sequence of operations in a cycle by use of temporary blocks or banks of supply, and (5) adopting management practices such as limiting the hours of receiving near the end of a season, scheduling truck arrivals, etc. Improved facilities, which will be discussed later, also will aid in reducing unproductive time, particularly delays caused by crew interference.

3. Giving labor better tools with which to work.

As a whole, marketing and storage firms have not taken a leaf out of the farmer's book when it comes to the adoption of improved equipment. This particularly is true with respect to materials-handling equipment. The adoption of improved technology on farms, coupled with improved practices and varieties, has made it possible for about 15 percent of the total population to produce the food and fiber needs for the entire country--with some left over. But the number of workers employed by marketing firms continues to increase 1 to 2 percent each year as the volume of products moving through marketing channels increases, which shows that by and large many marketing firms still are sticking with archaic and outmoded equipment, or in some cases using none at all.

There are, of course, a number of reasons why more marketing firms have not turned to industrial lift trucks and other improved handling equipment. One of the more important reasons for this failure to shift over constitutes a problem on which the Transportation and Facilities Branch of AMS has worked for many years--improperly designed facilities. An industrial forklift truck would be about as useful in the present New York food market facilities as a chandelier in a cow shed.

However, in many marketing and storage facilities, the substitution of industrial lift trucks for present handling equipment can substantially increase the productivity of labor. Our research in cotton warehouses shows that 1 worker using a 2-bale industrial clamp truck can handle about 4 times as many bales of cotton as 1 worker using a 1-bale, 2-wheel hand truck. In fruit packinghouses, 1 worker operating a 2-ton industrial forklift truck and 48-box pallets can handle about 10 times as much fruit as 1 worker using a 6-box, 2-wheel hand truck. In this illustration, it is assumed that the industrial truck operator builds the pallet loads. If he does not, the lift truck operator can handle about 15 times as much fruit as the hand truck operator. In both cases it is assumed that transport distances are over 100 feet.

It should not be concluded from these illustrations that the industrial lift truck is the most efficient handling equipment for all types of products under all situations. In our studies of banana handling methods and equipment, the 4-wheel hand truck with a superstructure for handling stems of fruit proved to be more efficient than forklift truck methods even though the hand truck method required slightly more labor per carload. The forklift truck method was less efficient because of equipment costs. The reason for bringing out this point is that, in comparing methods for performing specific operations, we cannot look at labor productivity--or labor requirements--alone. Total labor and equipment costs are the best basis for comparing the relative efficiency of various methods.

Smaller plants in particular should analyze equipment costs before making relatively heavy investments in equipment that will have only seasonal use for handling a single product. In such plants, equipment costs per unit

handled could alone amount to more than current labor and equipment costs. In this connection, I should like to refer to a recent research bulletin which concludes that an apple grower who produces 8,000 or more crates of fruit per year could effect savings in handling costs by purchasing an industrial lift truck. Now the lowest cost industrial truck that we know about is the 1,000-pound capacity, gasoline-powered, clamp-type truck, the initial cost of which is around \$3,200. Regardless of its annual hours of use, experts agree that such a truck should be depreciated over a 10-year period. On this basis, the annual cost of ownership, not including the cost of operation, would approximate \$450. If only 8,000 crates of apples were handled annually, equipment-ownership costs alone would be roughly 5.6 cents per crate. To this amount should be added the cost of operating the lift truck, which will run around \$1.65 per hour.

Because better tools for all marketing operations are not now available, considerable equipment development work is under way in the AMS. Without attempting to list all of these projects, a few of them might be cited as illustrations of how research can help provide industry's needs.

At Athens, Ga., AMS and the Georgia Station have developed a new dressed-poultry packing line. Tests show that by use of the new line, two workers can pack as much poultry as 5 workers can pack at a conventional table.

At the Red River Valley Potato Research Center a new conveyor and equipment handling crane for filling deep bins show promise of eliminating 2 workers from a 5-man crew. Flumes developed at the Center a few years ago, and now in widespread use, when used with the new potato elevator, eliminate 4 workers from a 5-man crew for moving potatoes from deep bins to above-grade packing lines.

An automatic box filler developed in the Pacific Northwest under a contract project practically eliminates the labor required for loose-packing boxes of apples.

4. Other means of reducing labor and nonlabor costs.

Before concluding these remarks, I should like to mention, but not elaborate on, some other ways of reducing both labor and nonlabor costs.

- a. The substitution of automatic for manual controls for various types of ventilation and aeration equipment is proving to be a labor saver in many types of storages. Usually these controls are set up to start and stop fans or blowers when predetermined conditions with respect to temperatures and humidities are reached outside the storage and to recirculate inside air under certain desired conditions. Automatic controls eliminate not only labor requirements in starting and stopping the equipment but also errors occasioned by manual controls.

- b. The substitution of recording, transcribing, and other communications equipment for manual methods also holds much promise for reducing handling costs. In one experiment it was found that one worker, the checker, could be eliminated from a 3-man crew used to load delivery trucks at a service wholesaler's warehouse by the use of recording and transcribing equipment. Similar equipment also was more efficient than "manual methods" for order receiving and transcribing.
- c. Although savings in labor costs have been stressed, the possibilities for effecting savings in equipment in other nonlabor costs should not be overlooked. Insofar as equipment costs are concerned, the possibilities begin with the purchase of the proper size or capacity of equipment for the job to be done. It is foolish to purchase a 1-ton forklift truck if a 1/2-ton truck will do the job. Possible savings in operational costs for various types of equipment also should be considered at that time--as an illustration, diesel-powered versus gasoline-powered trucks, trucks with and without clutches, etc.

In conclusion, I should like to emphasize that assistance to marketing and storage firms in achieving greater efficiency in their handling operation does not in all instances require the services of industrial engineers. Although their services should prove invaluable in marketing service work, there is no reason why marketing specialists with sound business judgment cannot aid individual firms in reducing the amount of handling being done, minimize unproductive time on the part of labor employed, aid in selecting equipment that will make labor more productive, and advise on other means of reducing both labor and nonlabor costs.

OPPORTUNITIES FOR REDUCING MARKETING COSTS THROUGH MORE
EFFICIENT WHOLESALING AND RETAILING

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The two principal facets of food wholesaling and retailing are those concerned with sales and operations. The phase to be discussed is the one concerned with operations. Work in this field was started in about 1950, using the problem-solving approach. Previous research emphasized the commodity. Most of the research is conducted by use of the experimental method, in direct cooperation with distributors. Our staff consists of marketing specialists, industrial engineers, economists, and retail experts. Improvements are devised in operational and managerial practices, methods, materials, equipment, and layout. Most of the savings result from making labor more productive.

The operational efficiency studies immediately point up the desirability of the functional approach, as contrasted to the commodity approach, to wholesalers' and retailers' problems. Most retailers know that it is not too

difficult to increase the sales of one item at the expense of other items. This is true also with regard to handling costs.

The greatest value in the operational type of research is the ability to help the retailer reduce costs. Labor costs constitute at least 50 percent of marketing costs. Assuming that the retail gross margin is 16 percent, then labor costs are 8 percent of sales. Studies have indicated that the costs of the most efficient operators can be reduced by at least 25 percent. Thus, the costs of these operators can be reduced by an amount equal to 2 percent of sales (25 percent of 8 percent).

Another value in the operational type of research is that retailers can be assisted in substituting machinery for labor, in finding ways of getting along with less skilled help in many instances, and in evaluating various types of machinery for specific operations. Small operators, as well as large ones, are assisted, in that research results are made available to them, and the know-how of the larger operators is passed along to them.

How does agriculture benefit from these activities?

Any reduction in the cost of marketing agricultural products from the time they leave the producer is reflected, in the long run, to the various claimants in varying proportions. Their final share is determined largely by the elasticity of the demand for the product and the degree of competition in the marketing channel. Research at the retail level, which is the final step in the marketing process, is just as effective in increasing the returns to producers as research in the assembly markets. The fact that some time elapses before all of the savings are reflected back to the producer or on to the consumer works to the advantage of the cooperating firms. Until the studies are completed and the results published and disseminated, individual firms have the opportunity of cashing in on them. This is the means by which they are recompensed for the expenses they incur by cooperating in these studies.

Types of research work that has been done include studies designed to improve (1) departmental operations in retail stores--checkout, grocery, meat, produce, frozen food, dairy, and small stores; (2) various operations in wholesale establishments--warehouse, office procedures, fieldmen, and whole-sale-retail coordination; and (3) some phases of personnel management--checkout, grocery, and managers.

Listed below are some examples of improvements in operations in retail and wholesale establishments and resulting increases in output. These examples were taken from reports that already have been published.

Checkout operation

| | |
|-------------------------------|----------------------|
| Conventional pull-type method | - 32 orders per hour |
| Redi-check method | - 44 orders per hour |

Result: 39-percent increase

Receiving operation (at 3 stores)

Conventional method - Store No. 1: 5 men, 94 cases
Store No. 2: 2 men, 225 cases
Store No. 3: 2 men, 147 cases

Improved method - Store No. 1: 2-1/3 men, 280 cases
Store No. 2: 2 men, 335 cases
Store No. 3: 2 men, 335 cases

Results: Store No. 1 - 198-percent increase
Store No. 2 - 49-percent increase
Store No. 3 - 128-percent increase

Stocking operation

Conventional hand-to-hand method - 23 cases per man-hour
Shelf extender method, 4 cans
to 2 hands - 37 cases per man-hour

Result: 51-percent increase

Smear-removing operation

Resulted in a 25-percent average increase

Layout of meat department

Improved layout reduced produce movement 45 percent and
human effort 70 percent

Frozen food operation

Improved methods, plus special dividers, increased productivity
80 percent

Potato packaging

Conventional method - 39 ten-pound bags per hour
Improved hand methods - 65 ten-pound bags per hour
Scoop and bag well - 85 ten-pound bags per hour
Auto bagger - 125 ten-pound bags per hour

Citrus coding

Use of coder and improved display methods resulted in a
158-percent increase in production

REDUCING MARKETING COSTS THROUGH MODERNIZATION OF FACILITIES

James E. Youngblood
South Carolina State Agricultural
Marketing Commission

Let us examine for a moment the concern these days over the matter of marketing costs. It is well to remind ourselves of the tremendous scope of this business of marketing farm products. The field of food distribution, for example, now requires about 5 million workers to get food from the farm to the consumer--more than the number of full-time workers hired to produce it. In other words, more people are employed by firms providing various services in the marketing of general field crops, such as assembling, storing, handling, processing, transporting, packaging, and merchandising, than it takes to produce these crops.

This suggests tools. The day of Plant - Plow - Pick - and Peddle is gone. An old English professor making a speech on educational programs cited the 4 R's. His version was Readin', 'Riting, 'Rithmetic and Room to teach them in. We may take our cue from this addition to the old saying.

As Dr. DeLoach stated earlier, all is not bad with marketing. It is tiring to hear repeated inferences that production sits on its throne of glory while marketing languishes back. We have gone a long, long way in providing suitable facilities for the marketing of farm products. In the same breath, however, we hasten to say that we also have a long way ahead.

The idea that improvement and modernization of facilities are largely time-saving propositions has penetrated our whole society, but in this particular field it means savings of dollars and cents. In this connection, people are too prone to think of "facilities" as a terminal market or a sky-reaching grain elevator. Also, possibly too much emphasis has been put on food of the perishable variety. As an illustration, in the pulpwood industry, large plants are departing from central locations, shipping point woodyards are being set up. These are facilities. From them, the pulpwood is shipped directly to mills or tied in bundles for storage. It is reported that this practice allows for better control of inventory and cuts down on deterioration of the wood by way of coordination of supply and processing. Modernization? These pulpwood people are trying out electronic weighing at shipping point yards. The reason? To speed up mechanical unloading and to eliminate scaling of loads at the main plant. Also, they are experimenting with debarking and skinning of wood at the shipping woodyards to remove the bark, twigs, exposed knots, etc. Why? To keep from paying freight on this excess baggage and to get the product more nearly ready for use upon arrival. These yards point up an example of modernization of facilities for cutting costs of marketing.

Another product that may be mentioned for consideration is milk. A recent USDA publication analyzes the comparative cost of handling milk in cans and in bulk. No attempt will be made here to go into a statistical belaboring on this subject. Suffice it to say at this point that this method

of collecting and assembling fluid milk and the facilities associated with it have seen a spectacular increase. However, while bulk handling of milk may be a general and almost routine practice in some sections, it might serve as a worthy marketing service project in some other place. The point is, many of our problems are relative.

The streamlining and expansion of processing facilities for poultry undoubtedly have vaulted that industry into prominence in the meat business. While great strides have been made in broiler production, steady and striking improvements in facilities to prepare the birds for ultimate consumption have contributed heavily toward a successful merchandising program for this farm product. We should not forget, as we visualize the assembly lines of processing plants, the greater impacts of processing. These facilities quite often constitute not only the birth but the growth of an industry in places where it is sorely needed. We have no notable instances of facility perfection to relate here. By no means are all these facilities big and precision-efficient. Many medium- and small-size operations offer fertile areas for marketing service work.

South Carolina has experienced a very recent development in the marketing of peaches--specifically, hydrocooling units. In 1952, South Carolina had 2 such units; in 1953, 8; in 1954, 42; and in 1956, the number had grown to 75--enough capacity-wise to precool all the commercial peaches in the State. Actually nearly 90 percent of the fruit was so treated. Where does reduction in marketing costs appear? The shipping agencies report an almost unbelievable drop in market rejections and the attendant price concessions. Another obvious result of these units is the influence on numbers of packing sheds now in operation. In Spartanburg County, the largest in the State, there were 254 sheds in 1947. This year there are less than 100, and the number is likely to decrease more. As facilities grow, so do the responsibilities of labor management. Modernization offers cost-reducing opportunities, but it also poses a more critical appraisal of how time and operating expenditures must be utilized.

Similarly, there is room for improvements in the facilities used in the marketing of many other farm products. In fact, I cannot think of a single commodity for which facility improvements cannot be made.

Central market facilities must be mentioned in this discussion. Naturally you would expect to hear from me on this subject since, as most of you know, I developed the Columbia Market. You have heard on other occasions the list of conditions and structures to be incorporated in a new style market place. You have heard that its main effect is a "one-stop, full-service" installation. Certainly, among the requirements that should be enumerated are: (1) Rail spurs serving wholesalers' units; (2) wide, spacious streets; (3) adequate parking areas; (4) front and rear entrances; (5) inloading and outloading platforms of correct height; (6) storage space that is easily accessible; (7) adequate refrigeration space; and (8) handling equipment.

These items are tangible. They can be supplied by a building contractor. In no sense should there be omitted such factors as a sound financial structure, able management, and an atmosphere of cooperation by and between the personalities commingled in the market.

Precisely how modernized facilities can effect operational savings in terminal, redistribution, and assembly markets would be a treatise by itself. Pinpointed, let us hear how an enterprising dealer sees ways to cut corners in marketing costs now that he issues from a well-appointed wholesaling unit.

1. Formerly it took 2 men and a truck $4\frac{1}{2}$ hours to haul a carload of produce to his place of business. Now with rail service at his back door, it takes 4 men and no truck 45 minutes to do the same job.
2. Weather damage from car to storage room is eliminated.
3. Placement of cars is not always on schedule. Loss of time and upsets of deliveries result when stores are at one location and spotted cars are in rail yards some distance away.
4. Dealers have "best" days. Customers like to see carloads adjoining wholesalers' stores, as they imply freshness.
5. Less handling saves breakage, particularly with such products as bananas and cantaloups.
6. Laborers may be shifted from the job of unloading for emergency work elsewhere if this operation is being performed at rear platforms instead of in rail yards.
7. Motors may be conveniently attached to fan equipment on cars to provide additional refrigeration.
8. There is the distinct advantage and comfort of having all operations performed within sight of the manager.
9. Top ice from loads at the rear platform may be used quickly in outloading trucks at the front platform.

So says a dealer. Every step reduces costs. We bow out with this general observation. Our entire economy is geared to mechanization. We are in a terrific race to outmode yesterday's tools with more efficient ones for tomorrow. We are only naive if we think it does not apply also to facilities for marketing farm products.

FRUITS AND VEGETABLES
(Work Group Sessions)

REDUCING COSTS OF MARKETING FRUITS AND VEGETABLES BY
PREVENTING DAMAGE, SPOILAGE, AND DETERIORATION

Leon Scott
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As an introduction to the subject that we have before us today, I would like to refer briefly to market pathology. Some of you may have attended USDA training classes either to qualify as terminal market inspectors or for some other reason, and are familiar with this subject. Market pathology is the first step in the training and enables one to identify the various diseases and decays of fruits and vegetables.

A plant or plant part is a living thing and certainly subject to injury, disease, and death. It is a highly sensitive organism, greatly influenced by its environment. There are many thousands of different kinds of plants, some of which are highly developed and extremely complex, and others relatively simple. Many kinds of bacteria and fungi invade the tissues of plants to obtain nourishment, and, as a result of their action, discoloration, breakdown, softening, and death of tissues occur, which is known as decay. The presence of decay in a commodity is one of the most conspicuous evidences of infection and disease.

The structure of the plant is composed of cells, tissues, and organs. The cell is the unit of structure and function. Tissues are a group of associated cells essentially alike, which perform a definite function. Organs are groups of associated tissues which perform a definite function. Cells in the leaves that contain chlorophyll have the capacity to absorb radiant energy from sunlight and combine carbon, hydrogen, and oxygen and make food (sugars). Respiration involves the exchange of gases (chiefly, oxygen and carbon dioxide) between the inner tissues and external air. The rate of respiration is greatly influenced by temperature. The amount of oxygen used, the amount of food burned up, the amount of carbon dioxide and water given off, and the amount of heat liberated are increased $2\frac{1}{2}$ times for each 18-degree rise in temperature. However, for each 18-degree fall in temperature, the rate of respiration and digestion (destructive processes) is reduced one-half. This is one of the most important reasons for the proper refrigeration of fresh fruits and vegetables.

The causes of plant diseases may be classified into three major types:

1. Parasitic
 - a. Bacteria
 - b. Fungi
 - c. Insects

2. Nonparasitic

- a. Unfavorable environment
 - (1) Temperature
 - (2) Moisture
 - (3) Light
- b. Chemical injury

3. Viruses

- a. Mosaic
- b. Leaf roll
- c. Curly top
- d. Spotted wilt
- e. Streak

In marketing fruits and vegetables, we are dealing with live commodities, and the following are some of the factors contributing to the development of decay and loss of fruits and vegetables during transit, storage, and marketing.

1. Unsuitable varieties of fruits and vegetables

- a. Susceptibility to disease
- b. Susceptibility to injuries

2. Unfavorable weather

- a. High temperature
- b. Low temperature
- c. Excessive moisture

3. Harvesting practices

- a. Rough handling
- b. Undue exposure to extremes of temperature

4. Processing practices

- a. Mechanical injuries
- b. Washing and chemical injuries
- c. Fumigation injuries
- d. Precooling damage

5. Packing and loading

- a. Loose and tight packs
- b. Bulge packs
- c. Improper packages
- d. Improper loading

6. Delay in transit

- a. Time loss
- b. Fluctuation in temperatures

7. Failure of refrigeration or heater service

- a. Chilling-freezing
- b. Heating
- c. Overmaturity
- d. Withering

8. Plant diseases

- a. Field diseases
- b. Transit, storage, and marketing diseases

Any deviation from the normal structure or function of a plant or plant part that endangers its life or decreases its marketability is considered a disease.

Factors influencing the development of disease are:

- a. Time
- b. Temperature
- c. Humidity
- d. Injuries
- e. Presence or absence of disease-producing organism

Organisms that cause disease are:

- a. Bacteria
- b. Fungi
- c. Viruses

All of us attending this work group session are certainly aware of the tremendous losses that occur each day from damage, spoilage, and deterioration of fruits and vegetables in the marketing channels. The percentage of losses is high, and the range varies by commodities, season of the year, etc. In many cases entire packages, lots, and even truckloads and carloads are damaged or completely destroyed by diseases, spoilage, deterioration, or other causes. Although in a number of cases these commodities show only a small percentage of damage, spoilage, and deterioration make it necessary to reduce the sale price or spend considerable money to recondition and repack the products. Now, who bears these losses? The growers, shippers, and storage and transportation companies all share these losses, but the growers eventually end up with most of the losses.

This has been a brief introduction to the causes of, and results from, damage, spoilage, and deterioration of fruits and vegetables. Now I will

attempt to tell you about some of the activities being carried on in Mississippi to help reduce the cost of marketing fruits and vegetables by preventing damage, spoilage, and deterioration. Our service program is designed to help growers and shippers improve their handling methods.

Sweetpotatoes. The production of sweetpotatoes in Mississippi involves a larger number of growers (most of them small) than any other vegetable grown within the State for commercial purposes. Yet until the inauguration of our marketing service program under the Agricultural Marketing Act of 1946, practically all of the growers lacked adequate knowledge and experience as to proper storage, grading, packing and/or packaging, and general marketing requirements. The result was a low market price for this commodity, and in many cases no market at all.

Rhizopus soft rot, black rot, charcoal rot, and freezing injury destroy a large percentage of the sweetpotatoes during storage, during shipment, in the market, and in the home. The Agricultural Research Service reports that the losses in shipment, in the market, and in the home amount to 18.8 percent. These losses may be reduced by proper storage facilities, proper handling, proper sorting and packing, and proper curing to heal cuts and bruises. Chilling and prompt marketing and utilization must be avoided.

Some of the ways that have been successful in helping to reduce the cost of marketing sweetpotatoes in Mississippi by preventing an excess percentage of damage, spoilage, and deterioration are:

1. By holding a series of harvesting, grading, and packing demonstrations at the farm level in conjunction with the Extension Service, the agricultural experiment station, county agents, vocational agriculture teachers, equipment dealers, and sweetpotato processors. The demonstrations and recommendations consisted of the following:

- a. Plowing up the sweetpotatoes.
- b. Avoid bruising, skinning, or fingernail cuts by using cotton gloves.
- c. Handle like a basket of eggs
- d. Segregate into the various grades before storing.
- e. Use proper method of placing potatoes in storage crates.
- f. Avoid storing potatoes from diseased fields.
- g. Avoid leaving dug potatoes in field, exposed to the sun or chilly weather.
- h. Harvest before killing frost and during dry weather if possible.
- i. Move to storage as soon as possible after harvest. The requirements for the successful storage of sweetpotatoes differ from those of most other vegetables. The curing process usually takes about 10 days, during which the storage house is kept at a temperature of 85° F., with relative humidity of 90 percent or higher. After the curing period, the temperature should be dropped to about 55° F., with humidity of 85 to 90 percent. Proper curing will heal all cuts and abrasions incidental to harvesting and handling.

2. By providing assistance in the marketing process, beginning at the storage point, on:

- a. Proper techniques in sizing and grading.
- b. Best type of container and proper methods of packing.
- c. Proper loading patterns for both cars and trucks.

Sweet peppers. This vegetable is very highly susceptible to damage, spoilage, and deterioration from Rhizopus rot, bacterial soft rot, gray mold rot, anthracnose, and scald, even when handled under the best of conditions. All losses that occur in the marketing channel certainly add to the marketing costs, as somebody along the line must bear the losses. Under the marketing service program in Mississippi, special emphasis is being placed on preventing damage to peppers from the field until they are placed under refrigeration, and on preventing as much spoilage and deterioration as possible while they are passing through the marketing channel. The practices being recommended to both growers and shippers are:

1. Harvest only fully mature pods of good quality.
2. Harvest very carefully to avoid injuries, and by all means avoid pulling the stem loose from the pod.
3. Deliver to packing shed as soon as possible after harvest.
4. Protect the top of the load from the sun by using a tarpaulin, sheet, or limbs from bushes that have green leaves attached.
5. Wash, wax, grade, pack, and place under refrigeration as soon as possible after delivery to the packing shed.
6. Properly grade and pack only good quality.
7. Prevent overpacking so as to avoid crushing or cutting of pods underneath lids.
8. Ice car or truck several hours before time of loading so as to have temperature around 50° F.
9. Stack containers tight in car or truck, but avoid jamming so as not to bruise the pods next to the sides of containers.
10. Pack in new container, either wirebound crates or bushel baskets, and make sure their lids are properly fastened.

Watermelons. Watermelon production in Mississippi is on the increase due to the fact that land formerly planted to cotton is being diverted to the production of watermelons. Most growers in the new production areas lacked adequate knowledge or experience to overcome any of the problems connected with the marketing of this commodity. The department has been working very closely with the Extension Service for several years and has been successful in helping to market this crop. It is estimated that about 15 percent of the watermelons moving through the markets are damaged by anthracnose, stem end rot, and other decays before reaching the consumer. Again, the losses must be borne by someone, and this cost of marketing usually reflects back to the grower. The following practices are some of the reasons for the successful movement of watermelons from Mississippi and the reduction in the cost of marketing by preventing damage, spoilage, and deterioration.

1. Harvest melons at the proper stage of maturity. The right stage of maturity is the first step in obtaining and maintaining quality.
2. Assemble melons at a concentrated point so that all buyers may have an opportunity to inspect the melons. Practically all melons in Mississippi are moved by truck.
3. A man with much experience in the handling of watermelons is placed at these assembly points, in addition to the inspector with his specific duties, to
 - a. Advise the growers on how to harvest their melons and at what stage of maturity.
 - b. Assist with the proper sizing and grading of the melons.
 - c. Assist and advise the loaders on proper loading patterns so as to avoid bruising and other injuries while in transit, which often occur in a poorly stacked truck or car.

Tomatoes. Tomatoes are produced in each State in this country, but commercial production is confined to about 30 States. Tomatoes are produced for two purposes: For canning and for fresh market. In Mississippi, tomatoes are produced principally for the latter.

The production of this commodity in Mississippi reached a low ebb about 7 years ago for several reasons:

1. Varieties were unsuitable.
2. Tomatoes were harvested before they reached the proper stages of maturity.
3. Improper packing techniques were used.
4. A high percentage of damage, spoilage, and deterioration occurred during marketing.
5. Many fields were completely destroyed by late blight.
6. Confusion and mistrust prevailed among growers and shippers.

With the inauguration of the service program, an attempt was made to improve the tomato situation. The department has been working very closely with the truck crops branch of the experiment station and the Extension Service, with each agency having a special function to fulfill but with one thought in the minds of all--that is, to get the job done. These efforts certainly paid off during the 1956 tomato season, and the following are some of the reasons for their success.

1. Only fully mature tomatoes were harvested, with maturity demonstrations being held at the farm level before harvest time.
2. Grading and packing demonstrations were given.
3. It was recommended that only U. S. No. 2 or better quality tomatoes be harvested and that off-grade tomatoes be left on the vine for canning purposes.
4. No harvesting was done during rainy weather.

5. Improved varieties were used, resulting in better consumer acceptance.

These practices resulted in the restoration of confidence and interest on the part of growers and shippers. By practicing these recommendations, growers received premium prices for their tomatoes. Itinerant buyers, on the market for the first time in several years, were well pleased with the program, and all tomatoes met with ready acceptance on the market with a minimum of damage, spoilage, and deterioration.

Other crops. Other commodities covered by the service program are cabbage, snap beans, lima beans, southern peas, head lettuce, okra, green corn, and pecans.

In conclusion, it should be pointed out that the damage, spoilage, and deterioration of fruits and vegetables occurring in the marketing channels cannot be completely obliterated. However, by a lending of talents, training, and knowledge, losses from these causes certainly can be reduced, and the cost of marketing fruits and vegetables thereby will be reduced. Most growers are ready to accept aid in marketing their crop and to follow recommendations and developments designed to improve the quality of their products so as to meet greater consumer acceptance. However, it is certain that only a few growers will seek assistance. Therefore, it is the duty and responsibility of marketing service personnel to take the information to them. A great number of the grower's problems, of course, will not come within the scope of marketing service work, but those problems can be referred to the proper agencies. If all the agencies within each State were a little more familiar with one another's work and duties, then each agency would be in better position to render a more efficient service in its designated field. The field is large enough for all agricultural agencies, and by working in harmony, their efforts will benefit growers. I am happy to say that all agricultural agencies in Mississippi are enjoying a fine relationship and through an understanding of one another's duties agriculture is being benefited. I am sure that each of us attending this workshop will benefit from the experiences of others, and will go back home with a better knowledge of how to attack and handle individual problems.

IMPROVED PRACTICES IN THE MARKETING OF FRUITS AND VEGETABLES

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Indiana has been interested in evaluating some of the quality factors of perishable commodities (tomatoes, apples, and sweet corn) as they affect orderly marketing of these crops. This paper will discuss the development of a unit color-defect system for purchasing tomatoes for processing, objective evaluation of the color of apples, and the relationship between sweet corn yield and quality.

Canning tomatoes. Indiana farmers planted approximately 36,000 acres of tomatoes which produced over 300,000 tons for processing in 1956. The problem of determining the value of the crop begins with the arrival of the fruit at the cannery. A Federal-State grader takes a random sample from the load as it is unloaded. He subjectively determines whether each individual fruit is a U. S. No. 1, U. S. No. 2, or cull. The weight of the fruit in each quality classification is determined and related to the whole load. In this manner, the value of the load of fruit is determined according to a previously written contract. Typical prices paid per ton in Indiana in 1956 were \$33 for U. S. No. 1's, \$22 for U. S. No. 2's, and nothing for culls. Obviously, it is not an academic question when the grader decides whether a tomato is a low U. S. No. 1 or a high U. S. No. 2 for color, as the difference in value to the grower may be as much as \$11 a ton.

The Hunter color difference meter has been shown to be useful in measuring tomato color (2). 5/ Desrosier and his co-workers studied the relationship of tomato surface color and juice color in Indiana (1), using the Hunter meter. Results of these studies indicated that the value of the fruit for processing could be determined best by measuring juice color contrasted to fruit surface color measurements.

The fact that the Hunter meter was too expensive and too complicated to be used by graders as an objective color measuring device prompted development of the Purdue color meter (1). This meter was found to give values which were closely related to the Hunter meter values.

With this background we may now discuss the unit color-defect system for purchasing tomatoes for processing (2). When the load of fruit arrives at the plant, a random sample is taken by the grader as the truck is unloaded. The random sample is further divided by use of a subsampling table which selects approximately one-tenth of the total number of fruit. The weight of the subsample is then determined, all defects are trimmed from the fruit, and the weight of the defects is determined. If 3 percent of the subsample is eliminated by trimming, then 3 percent of the weight of the fruit is correspondingly subtracted from the weight of the load.

Juice is prepared from the trimmed fruit by use of a small laboratory pulper. The color of the tomato juice is then determined objectively, and the dollar value obtained from a price-color curve based on contract prices.

Apples. Apples from the same tree exhibit tremendous color variation among individual fruits. There is little or no difference in the nutritive value of various lots of fruits of different colors; however, the market value may be 3 times as great for the well-colored fruit. Thus, the importance of color in marketing apples is apparent. Using the Purdue color meter, the variations in fruit color of apples within individual varieties were studied.

5/ Numbers in parentheses refer to a list of references at the end of this speech.

It was found that the frequency of occurrence of fruits having a particular color value varies with the variety of apple. Much more information of this type is needed before a completely objective method for determining the dollar value of apples can be developed. This objective evaluation offers a method for improving apple marketing practices.

Sweet corn. The problem of sweet corn marketing has been studied during the past 4 years by workers in a cooperative project involving Iowa, Wisconsin, Minnesota, and Indiana. As sweet corn matures, the yield of corn in tons per acre increases while the quality for processing decreases. But how much does yield increase and quality decrease? What is sweet corn quality? How may it be measured? Is it possible to relate yield and quality and evolve equations for predicting the increase in yield as related to maturity? The answers to these questions would enable growers and processors to write contracts which would result in a fair price to each party and would tend to improve the quality of corn processed.

In order to study canned and fresh sweet corn quality, it was necessary to remove the kernels from the cob in a manner similar to the commercial method. A simple device was constructed by mounting a single commercial cutter in a frame and turning it with an electric motor.

Further study revealed that the pericarp content of sweet corn was closely related to yield. Alcohol-insoluble solids were also found to be highly correlated with yield ($r = 0.93$). Moisture, pericarp content, kernel size, and a combination of all these items were found to be related to tenderness and maturity scores of the Agricultural Marketing Service with varying degrees of correlation. The highest degree of correlation ($r = 0.77$) was found when a combination of the above listed items were related to AMS tenderness and maturity scores. Results of these data indicated that the quality of sweet corn involves at least two factors, that is, (1) moisture content, and (2) pericarp content and tenderness.

As the percent of moisture decreases, the yield of sweet corn increases. Calculated on the basis of 73 percent moisture being equal to 100 percent yield, 80 percent moisture resulted in only 60 percent of the yield which would have resulted if the corn had been left in the field until it reached 73 percent moisture. Likewise, corn harvested at 60 percent moisture resulted in 174.4 percent as much corn as would have resulted if the corn had been harvested at 73 percent moisture.

Based on the above data, equations were developed for predicting yield and quality in terms of AMS maturity scores. They are as follows:

1. Percent expected yield = $517.56 - 5.72$ (percent moisture).
2. Expected canned corn AMS tenderness and maturity score = $25.4 + 0.293$ (percent moisture) - 3.93 (percent pericarp content).

The only subjective value involved in the above equations is the AMS tenderness and maturity score. An attempt was made to develop an objective test for the factor of tenderness and maturity of kernels.

A commercial home-type food chopper equipped with a 115-volt, universal-type electric motor was connected through a voltage regulator to a power source. A microammeter was incorporated into the system so that the electrical energy required to turn the motor could be determined with samples of sweet corn at various stages of maturity in the grinder assembly. Preliminary evaluations indicated that variations in the amount of current used due to friction was excessive; therefore, the food chopper was redesigned. Needle-type bearings were installed at each end of the drive shaft, and a roller-type thrust bearing was mounted at the rear of the screw housing.

The effect of sample size on the tenderness value was studied. Subsamples from No. 10 cans of whole-kernel sweet corn, ranging from 10 to 80 grams, were placed in the grinder and tenderness values were obtained. It was found that tenderness values increased as the sample size increased from 10 to approximately 75 grams. Since the grinder hopper contained 80 grams of corn when level-full, subsequent samples were not weighed. For each evaluation the hopper was filled level-full. The resulting tenderness values were found to be highly reproducible.

A high degree of correlation was found to exist between tenderness values and alcohol-insoluble solids ($r = 0.73$) 6/ and tenderness values and pericarp content ($r = 0.90$). 6/

Tenderness meter values and AMS tenderness and maturity scores were also found to be correlated ($r = 0.81$). 7/

Summary and conclusions. Quality factors affecting the orderly marketing of tomatoes, apples, and sweet corn were discussed. The development of a unit color-defect system for use in purchasing tomatoes for processing was described. This method was shown to be completely objective. The results are related to the manufacturing worth of a load of tomatoes.

The objective evaluation of apple color and its relationship to marketing was described.

The relationship of sweet corn moisture content to yield was discussed. It was indicated that expected yield could be determined by the following equation:

$$\text{Percent expected yield} = 517.56 - 5.72 (\text{percent moisture}).$$

6/ Highly significant, 1 percent level.

7/ Significant, 5 percent level.

The equation for predicting AMS tenderness and maturity scores of finished canned corn from raw sweet corn samples was:

Expected AMS tenderness and maturity score = $25.4 + 0.293 (\text{moisture}) - 3.93 (\text{percent pericarp content})$.

A device and method for objectively determining AMS tenderness scores were described.

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CONCLUSIONS AND RECOMMENDATIONS ON REDUCING COSTS OF MARKETING FRUITS AND VEGETABLES BY PREVENTING DAMAGE, SPOILAGE, AND DETERIORATION

The problems in this field were discussed by representatives from 21 State departments of agriculture and the U. S. Department of Agriculture. The States represented included some that are distant from major markets and some adjacent to such markets. The resulting differences in points of view with respect to what needs to be done in this field were reflected in the deliberations of the group.

The group recognized that a varied approach needs to be followed in bringing about a reduction of spoilage and deterioration losses in the marketing of these commodities.

It was the consensus of the group that State department of agriculture people can render greater service in helping to solve these problems by initiating or expanding marketing service programs with emphasis on the following activities:

1. Encouraging and assisting growers and shippers in the adoption of better packages and packing methods.
2. Assisting specific industries to establish or find diversionary outlets to utilize temporary surpluses of fresh market commodities in danger of spoilage and deterioration.
3. Assisting growers in adopting better harvesting methods which will result in the harvesting of commodities at the proper stage of maturity. In this connection it was the belief of the group that more research is needed to develop objective methods of determining maturity.

4. Promoting more direct methods of marketing and assisting growers and shippers in other ways to speed up the movement of the commodity to market.

5. Encouraging and assisting truckers to do a better job of refrigerating products in transit to market.

6. Initiating or expanding programs to assist wholesalers and retailers in adopting improved handling and merchandising methods.

7. Assisting commodity groups in considering the advisability of marketing orders to regulate the quality and pack of fruits and vegetables permitted to move in marketing channels, and, where legislation is necessary to permit such regulation, helping industry groups in drafting appropriate legislative proposals.

REDUCING COSTS OF MARKETING FRESH FRUITS AND VEGETABLES
BY IMPROVING HANDLING METHODS AND EQUIPMENT

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(Outline of unwritten speech)

- I. Producer receives only 30 to 35 cents of consumer's dollar spent for fresh fruits and vegetables. Marketing costs are higher because of:
 - A. Higher degree of perishability and greater losses from spoilage and waste.
 - B. Rough and excessive handling on older food terminal markets, which increases handling costs and contributes to losses.
 - C. More protective services required than for some other products.
- II. At concentration points (storages and packinghouses), costs of handling required in preparing products for market usually greater than in other handling work. Examples of developments resulting in reduced costs of:
 - A. Preparing products for market.
 - 1. Sorting (grading) tables.
 - a. Improvements in reverse-roll table.
 - b. Development of float-roll table.
 - 2. Traverse-roll size table.
 - 3. Return-flow belt accumulator.
 - 4. Packing equipment.
 - a. Mechanical tray packer.
 - b. Volume fill device.
 - c. Automatic box filler.
 - B. Moving products into, within, and out of storages and packinghouses.
 - 1. Flumes for handling bulk-stored potatoes.

2. Modified bucket elevator.
3. Ton-box tipper.
4. High piler.
5. Crane and lightweight conveyor for deep bin storages.
6. Introduction of 24-box clamp-type trucks for handling fruit in multistory buildings.

III. On terminal markets, wholesalers essentially are handlers of materials. Except for bananas and tomatoes, they do little grading and packing of products. Results of research to find lowest cost methods indicate:

- A. Where facilities will permit, more handling of unit loads is desirable.
 1. Where volume is sufficient, by forklift trucks and pallets.
 2. Where volume is relatively small, by skids and jacks, or even
 3. By hand trucks.
- B. Fixed conveyor lines in wholesale distribution warehouses are not too efficient.
- C. No one method is best for handling all types of packages.

IV. Suggestions as to how service workers can assist individual firms:

- A. By making more exact comparisons for individual plants of handling methods, and computing savings.
- B. Observations in plant to suggest means of reducing unproductive labor time and number of times products are handled.

REDUCING COSTS IN PRODUCING AND PROCESSING VEGETABLES

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There has been a consistent increase in the importance of the processing industry in the successful marketing of fruits and vegetables. The percentage of the total sales of vegetables for processing increased from 26 percent in 1934-36 to 34 percent in 1949-51. The fresh frozen vegetable industry's phenomenal rise has played a large part in the increase in processed vegetables. From 1942 to 1955, the frozen vegetable pack increased from 152,512,000 pounds to 1,139,695,000 pounds.

Three principal areas in which savings can be effected in the production and processing of vegetable crops are:

1. Crop control in the production of the raw product.
2. Operating efficiency in the processing plant.
3. Budgetary control of costs and efficiency in the processing plant.

1. Crop Control in the Production of the Raw Product.

Scientific crop control offers a great many advantages. Among them are:

- (a) Advanced methods of arranging planting schedules that will give the processing plant a more uniform flow of raw product during the harvest season;
- (b) effective weed and insect control programs;
- (c) a field pretesting system;
- (d) better methods of handling, transporting, and storing the raw product; and
- (e) better ways of grading the raw product.

a. Planting schedules. Planting schedules can be improved by the use of the heat unit system. It has been determined that pea seed will start to germinate and grow at an average temperature of 40° F. Heat units are figured by taking an average of the daily maximum and minimum temperatures and subtracting 40° from this average. For example with a 60° maximum and 40° minimum the average of 50° minus 40° would give an accumulation of 10 heat units for that day. Higher temperatures during the harvest season than during the planting make it essential that the producer arrange his planting so that enough heat units accumulate between plantings to allow for a uniform harvest season. The heat unit system is modified somewhat by differences in moisture, soil type, and slope of the various fields.

b. Weed and insect control. Weed, insect, and disease control is important in quality and in case-yield of the raw product. In the Pacific Northwest area, the niteshade weed has been very bothersome because the niteshade berries are harvested with the peas and, in some instances, go into the cans with the peas. The field application of dinitro as a selective spray has been very successful in controlling this troublesome weed. Green pea producers in the Midwest have been successful in controlling the Canada thistle flower-bud formation by timely field spraying of the chemical sodium M.C.P. If used correctly, this chemical delays bud formation on the Canada thistle long enough for the peas to be harvested.

Insect control is very important to the food processor in that insects can reduce raw product quality and case-yield. It is important that producers have reasonable control of corn earworm and corn borer on sweet corn, aphid and pea weevil on green peas, leaf hoppers and other insects on green beans, and insects on various other processing crops.

c. Field pretesting of the raw product. Field pretesting of the raw product can be of great value in any green pea or sweet corn operation. This is essentially a sampling and a grading procedure. Samples are taken in each field 2 to 5 days before harvest. The purpose of pretesting is to give information from which management can plan harvest and factory operations well in advance. A good representative sample should be taken from each field, or part of the field, and carefully graded according to the same procedure regularly used for that particular product. In the case of sweet corn it may be the percentage of moisture, or in green peas it may be a tenderometer reading. With this pretest information, management can better anticipate the volume of raw product available for the following days' production. It also helps management in determining the best time to start the season's operations.

Pretesting can be used profitably in the processing of sweet corn, green peas, snap beans, lima beans, and possibly other vegetable crops.

d. Handling, transportation, and storage. Bulk handling of the raw products to be processed offers many opportunities in the saving of time and labor.

One of the newer developments in the handling of vegetables from field to factory is the "pallet crate." This typical wirebound pallet crate holds a ton of some products, and for beans and miscellaneous vegetables has a capacity of approximately 25 bushels, or up to 1,500 pounds. Along with a forklift truck and automatic dumper, the wirebound pallet crate has made it possible to eliminate a large part of the labor for loading and unloading operations. Snap beans, white and sweet potatoes, cauliflowers, broccoli, sweet corn, spinach, and pumpkin have been handled successfully in these containers.

Another type of bulk handling of both green peas and lima beans is the use of 55-gallon steel drums, 4 of which make up a pallet load. The pallets are loaded onto flat-bed trailers for transportation to the plant, where unloading is entirely by forklifts. Savings are made by this method over the use of lug boxes as follows:

- (1) Cost of containers.
- (2) Container sanitizing, repair, and replacement costs.
- (3) Transportation expenses between viners and plant.
- (4) Loading and unloading time.
- (5) Labor required for loading and unloading.

Bulk tank trucks are being used in transporting green peas and lima beans. The raw product is dumped into the tank with cold or iced water. Upon arrival at the plant, the raw product can be pumped into the receiving line in the plant. This procedure can reduce labor requirements considerably in comparison to the use of lug boxes.

There has been a concerted effort to develop mechanical harvesting equipment so badly needed if harvest costs are to be kept at a minimum. The bush bean picker is being used successfully. Processors are able to relieve some of their labor problems by substituting the mechanical bean picker. The mechanical pole bean harvester, automatic viner feeder, pea and lima bean combine, and conveyor-type tomato harvester are a few of many mechanical vegetable harvesters being developed and in use in the processing vegetable industry.

A very successful dump trailer has been developed, which is pulled behind the mechanical sweet corn picker. Fully loaded, this trailer, with a high lift, side delivery, hydraulically actuated mechanism, will dump 2 tons of sweet corn into a truck with a side height of better than 100 inches from the ground. During wet weather there is no need to have trucks stuck in the field, because the harvesters can bring loaded trailers to the waiting trucks

at the end of the field or on the hard road. The following is a conservative estimate of savings effected:

| | <u>Percent</u> |
|--|----------------|
| (1) Labor (truck drivers) | 70 |
| (2) Truck maintenance and repair | 85 |
| (3) Investment (trailers in place of trucks) | 20 |

e. Raw product grading. In many areas it has been the standard practice to buy the raw product on a flat rate per-ton basis, encouraging the production of quantity without due regard to quality. Quality of raw product is important because it has a direct effect upon the quality of the processed product, and also on the efficiency of the processing operation due to variation in case-yield of the raw product. A practical grading system for most vegetable crops should be adopted by the processor along with the establishment of equitable price differentials between grades. Many different types of instruments are being used to determine grades of the raw product, some of which are the tenderometer, refractometer, moisture meter, and the shear-press. Better control of raw product quality through proper grades and price differentials can increase factory efficiency and decrease production costs.

2. Improving Operating Efficiency in the Processing Plant.

a. Plant remodeling and design. Modern processing plant design is highly technical and requires personnel trained in engineering and production. The average independent processor cannot afford highly trained specialized personnel, so he must get his information from outside sources. In most instances, information on plant design and construction is available from engineering departments of can manufacturing companies and canning machinery manufacturing companies.

New or remodeled processing plants should be designed to eliminate waste motion, down time, and waste of product and packaging materials. Also they must be engineered to produce a large volume at low unit costs in order to remain in a competitive position with the rest of the industry.

b. Automation. Automation is becoming just as important in the food processing industry as it has in more mechanized industries. To survive, every processing plant has to put it to work--at least on as large a scale as its competitors--to reduce costs, increase capacity, and improve control of quality.

Automation, reduced to its simplest terms, means to make automatic any operation or series of operations. There are many examples of individual automatic controls in a processing plant, such as temperature controls on blanchers, brine concentration controls on quality graders, conductivity cell control of the concentration of caustic solution in lye peelers, and temperature of the filler bowl.

The best approach to automation for the independent processor is to become familiar with the latest machines and instruments available for performing and controlling unit operations in the food plant, with the thought always in mind on how this machine might improve his operation. The increased use of automatic instrumentation in small food plants offers fruitful opportunities. Such progressive action can bring about reduction in costs and increase in product quality.

An outstanding development in automation which has been widely adopted by the canning industry is the continuous cooker-cooler. A combination of functions is performed by this equipment which in traditional operations requires retorts and cooling canals. This equipment offers all the features of automation that have to date been applied to this part of the process. It greatly increases production per man-hour of effort. It improves quality of product through faster heat penetration, thus reducing the undesirable effects of heat upon the product. It saves production space, reduces handling, and considerably improves overall efficiency.

One food processing factory has increased automatic factory control by use of a central panel board with remote controls which operate 5 units of a pea canning operation. The five functions of the control panel board are:

- (1) Controls chlorine fed into the water.
- (2) Starts or stops blancher, and regulates temperature.
- (3) Regulates the density of the brine solution in the gravity separators.
- (4) Regulates, by temperature recording instruments and controls, two pre-heaters for the continuous cooker.
- (5) Has control and temperature recording instruments for the two cookers.

c. Labor-saving machinery and equipment. In an effort to cut costs by replacing labor with additional machinery and equipment, many things should be considered. In an individual factory, it would be best to review each part of the manufacturing cycle to arrive at a percentage of labor expended in each operation; to determine what functions, if any, in addition to those already performed, can be done by the purchase of labor-saving machinery and equipment. The following are points to take into consideration:

- (1) Capital funds that must be invested.
- (2) Maintenance costs.
- (3) Interest costs.
- (4) Increased productivity.
- (5) Depreciation as a cost.
- (6) Total wages saved.
- (7) The period of time it would take for the machine to pay for itself as contrasted to its normal life.

Another consideration that should not be overlooked is the increased production that may result from the acquisition of additional equipment. To get the maximum value from this equipment, it is not unreasonable to assume that the output will be increased. Increased production, in turn, will entail additional working capital.

Forklift trucks, can unscramblers, automatic casers, quality separators, froth flotation washers, and continuous cookers are a few of the various types of equipment that can contribute to lower costs and more efficient operations.

The froth flotation washer used in the green pea line to remove niteshade berries and other extraneous materials is now a well-proved aid in reducing picking table costs and achieving a high quality product. This washer floats off the extraneous materials by using a solution which consists of about 1½-gallons of deo-base oil per 100 gallons of water, and 4 ounces of orvis (detergent). Density of the solution in the tank is controlled mostly with the detergent and air. This froth flotation washer has been used with unusually good success in removing from whole kernel corn such extraneous material as damaged kernels, parts of cob, and insect fragments. Thus, considerable savings have been effected in the reduced amount of labor necessary in trimming and inspection.

Processors have been able to replace labor by installation of the continuous cooker-cooler. Due to the very high cost of this machine, the packer is forced into volume production to get maximum value from this equipment. Usually, because of its high cost, the entire operation is set up so that the continuous cooker-cooler sets the pace of the production line.

d. Work simplification program. A formal work simplification program is probably out of the question for the smaller independent processor, but no doubt it would help if management would take time to study and analyze some of the work methods and procedures used in the factory. In analyzing the job or method, the manager might ask these questions:

- (1) What is done? Why is it done at all?
- (2) Where is it done? Why is it done there?
- (3) When is it done? Why is it done then?
- (4) How is it done? Why is it done this way?

An analysis such as this may bring to light many useless and unnecessary actions in the procedures or methods being used at the present time.

e. Preventive maintenance program. Preventive maintenance might be defined as the systematic servicing and inspecting of equipment, the remedying of small defects immediately, and the reporting of major defects for correction or repair.

For consistent high-level production, preventive maintenance is essential. A good adage to subscribe to is, "An ounce of prevention is worth a pound of cure." It is far cheaper to check and properly grease a piece of equipment than to repair it after a breakdown has caused a costly delay in the factory operation.

Production costs can be lowered by a well-organized preventive maintenance program. Some of the factors which make up a good program are as follows:

- (1) Properly trained maintenance personnel.
- (2) Schedules should be set up, and supervision should see to it that they are followed day in and day out.
- (3) A program of daily checking and greasing should be set up.
- (4) Manufacturers' recommendations should be passed on to all personnel.
- (5) Operators should be cautioned as to what must be looked after and what signs are danger signals in the equipment for probable lost time.
- (6) Proper and accurate records should be kept on all equipment, whether the plant is large or small.

f. Safety program. Accidental injuries in the processing factory are costly to both employee and employer. The yearly monetary loss in this country from all accidents has been variously estimated at 9 to 10 billion dollars. Of this cost, manufacturing industries pay out an estimated yearly sum of \$45 to \$50 per worker. The processing field offers many opportunities for accident reductions, since the food field ranks near the top in both frequency and severity of accidents. Accidental injuries can be lowered by:

- (1) Installation of protective devices on equipment and the engineering of both plant and equipment for maximum safety.
- (2) Safety education and promotion.

Most of the small independent vegetable processors are in need of a formal safety program.

g. Sanitation program. The sanitation level of any food factory operation has a direct effect upon product quality. Unsanitary conditions may cause high spoilage rates, low quality of product, and, in extreme cases, citation or perhaps prosecution by the Federal Food and Drug Administration. The answer to this problem is an effective program of plant sanitation. Any program must consider three basic problems:

- (1) Physical contamination. This usually is a visible contamination and is the most easily detected.
- (2) Bacterial contamination. This is an invisible contamination which must be watched through many different types of inspection.
- (3) Chemical contamination. This may be either visible or invisible and can be very dangerous as a toxicity problem.

The program should consist of two phases: A continuous program, done by production workers during actual running time, and a specific cleanup operation carried on after each work shift.

3. Budgetary Control of Costs and Efficiency in the Food Processing Plant.

The average food processing company probably has three general budgets: Capital, repair, and operating. The greatest opportunity in lowering costs is through the operating budget.

The operating budget should contain estimates of the following, usually based on averages of operations in former years:

- (1) Volume of pack (based on reasonable estimates).
- (2) Anticipated total dollar sales volume (arrived at by multiplying budgeted cases to be sold by estimates of sales prices).
- (3) Direct costs, including direct labor, raw product, case yield, grade of product, cans, condiments, cartons, etc. (Adjustments should be made for known or expected increases.)
- (4) Direct costs on a unit or per case basis. (Cost should be figured according to each can size, style, and grade of the various products manufactured.)
- (5) Overhead costs as to total and a per case basis. (Overhead costs include all costs of doing business that vary only slightly with the volume of pack.)

The overhead costs, combined with direct costs, make it possible to estimate the total cost of packing and selling all items during the year. If the budget is going to be a useful tool for management, there must be controls over that budget. The processor must know in which direction he is heading. During the season, checks must be available so that management can put the operation back on the track if it has wandered from the path outlined.

For operating efficiency, controllable costs, the most important of which are direct labor costs and raw product costs, can and should be available on a daily basis. Direct labor costs should be prepared on a per case basis in a consistent manner by adjusting the pack each day to a common basic item. In this way variances in cost from budget costs are due to efficiencies or inefficiencies of labor. If variances are found, steps can be taken to make changes when they will do some good, not when the pack is over.

Another controllable element of cost is raw product. Daily information should be available on costs per ton, recovery or case-yield, grade yields, and costs per basic case. Here, again, if costs are known, steps can be taken to make corrections on a timely basis.

Statistical quality control. It should be added that statistical quality control is a valuable tool which can be used by food processors to control accurately grading and production procedures. Grading procedures such as insect fragment counts, mold counts in tomatoes and tomato products, and taste panels can be set up and controlled on a firm statistical basis. The can-fill of any product can be controlled through statistical means by plotting drained weights of the vegetable product on control charts. Also incoming salt, sugar, and metal and glass containers can be checked very efficiently with samples taken in accordance with accepted statistical procedures.

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING FRESH AND PROCESSED FRUITS AND
VEGETABLES BY IMPROVING HANDLING METHODS AND EQUIPMENT

In the discussion of this subject, representatives from the States pointed to a number of examples where they have been able to assist producers and local assemblers in adopting more efficient methods and equipment for preparing fruits and vegetables for the fresh market. It was generally agreed, however, that much remains to be done in this particular area and that marketing service activities at the local assembly level should continue to have a high priority in the matched-fund programs of the various States.

The discussion brought out that producers of fruits and vegetables in many States and areas are faced with the problem of either changing their marketing methods or of seeing their outlets vanish. For many commodities and areas, the farmer pack may well be on the way out as more and more of the retail volume is concentrated in the integrated corporate chain and supermarket types of business. This poses a serious problem for the small producer. In situations where the only practical answer to this problem is the development of central packing, marketing service people have a real opportunity to provide assistance in the organization of marketing agencies to perform the local assembly function and to help these agencies in determining their equipment needs and in adopting the most efficient packing and handling methods.

More attention needs to be given by the State departments of agriculture to the problem of providing efficient transportation facilities for moving fruits and vegetables to market. In this connection, the group strongly recommended expansion of those marketing information programs whereby truckers and other buyers are kept currently informed of the availability and location of supplies.

In a number of States, direct roadside marketing by farmers is of considerable importance, and further growth in this method of marketing appears likely. The group felt that in those States where roadside marketing is fairly important, consideration should be given to the development of a program to assist operators of these outlets in improving grading, packing, and display methods.

It was the recommendation of the group that those States which are in a position to do so should develop programs with wholesalers and retailers to encourage the adoption of more efficient equipment and methods of handling and displaying fruits and vegetables.

The group discussed to a limited extent what could and should be done by State departments of agriculture to assist processors in reducing costs through the adoption of more efficient equipment and processing methods. However, no definite conclusions were reached in this regard.

REDUCING THE COST OF MARKETING FRUITS AND VEGETABLES BY IMPROVING DISTRIBUTION FACILITIES

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North Carolina Department of Agriculture

Most local community market facilities are out of date, inadequately equipped, and expensive to operate. For the most part, the volume handled in most of these markets is not sufficient to attract volume buyers or to produce the necessary revenue that is needed to operate this type of facility. The wartime economy of the early forties on through the early fifties through necessity used these markets as buying and assembling points. The prices paid during this wartime economy and the merchandise that was moved gave the producer using these facilities a sense of well-being, and the facilities that they were using were providing for their needs. However, since 1953 the technology of production continues to give increased production units per acre and, with but few exceptions, has caused surpluses to develop. The causes of these surpluses can be attributed first to the producer and then to the marketing facility that he now is using. After several years of a seller's market, in which the demand exceeds the supply, the quality goes down and initiative with it. The changeover to a buyers' market has brought about an increase in the demands of the buyer for services which heretofore were not required. It is this change with which we are now attempting to cope by providing proper facilities equipped with machinery designed to standardize and condition the particular commodities grown for a particular market.

The improvement of these facilities is made much easier when the facilities are owned by the producers themselves. In this case, there would be an integration of service people from the State department of agriculture, the Extension Service, extension horticulture specialists, and research workers that lend themselves to improvements in marketing. To continue in the present economy, these markets must provide proper facilities and sufficient equipment to perform necessary services. Otherwise, this type market is unable to compete with other producing sections in supplying present-day consumer demands. When these facilities are owned by people other than producers--in North Carolina, it is the buyers themselves--it is difficult to attempt anything other than minor changes, as there seems to be an unwritten law in the buyer-ownership markets to keep the investment as small as possible and make as much money as they can. Seldom, if ever, does this type of market apply any of the profits to more adequate facilities, and it is losing volume so rapidly that it no longer will be profitable to operate.

The North Carolina shipping point auction markets are in reality assembly markets. Most of them come under the buyer-ownership class, and the services that they perform are left to the buyers entirely. If the buyer regrades or conditions and standardizes the produce that he buys through the auction block, it is done on his own equipment and for the express purpose of meeting competition. The producer pays for all of these services by selling a product that is not properly graded or packaged. As the supermarket chains grow in size, the buyers become fewer and more demanding as to quality.

This brings us down to the small producer who is not in a position to buy expensive equipment or build facilities of his own to perform these extra services in order to sell his product at a profit. The only solution to this problem is for the small producers to join together on a cooperative basis in building their facilities and equipping them for handling their production. These small producers may act as a cooperative association, or company. Through this type of assembly market, small producers can gain the advantages of using proper equipment for conditioning and standardizing their various commodities. The share of the consumer's dollar to the producer is in direct proportion to the services performed by him before selling. North Carolina is working for this type of assembly market, not only to replace the antiquated type but also better to meet the needs for dependable and profitable outlets.

One of the projects in North Carolina this year involved a market that had become antiquated, and the volume had fallen to the point where it was no longer possible to interest large-volume buyers. The sole physical facility of this market consisted of a shed 60 by 80 feet, with a platform at truckbed height covering one-third of the area. The only equipment was an old, worn-out bean belt, where beans sometimes were hand graded. The request for assistance on this market came from the producers through their county agent. Specialists from the State department of agriculture surveyed future potentialities for the marketing area, and held a meeting which was attended by 95 percent of the producers using that facility. Needed changes in the facility and the amount and type of equipment that should be provided in it were explained in great detail. It also was pointed out that these improvements were necessary if the community was to continue in the vegetable business. A cooperative organization was set up at the next meeting, which was attended by specialists from horticulture, cooperatives, and marketing. The market was completely renovated, and a platform at truckbed height was built over the entire roofed area. A new cucumber brusher, a hot waxer, a grader, a double-fan bean belt, and a precooler were purchased and set up for operation. The producers themselves signed an agreement with the new cooperative exchange guaranteeing to deliver their produce in field containers to this facility for proper conditioning and standardizing and assembling in lots of like commodity and grades. Thus, buyers were able to load out straight loads at f.o.b. prices in direct competition with an auction market owned by the producers and set up at one end of the shed. The first season's operation proved beyond a doubt that the assembly type market, properly equipped to do the job, reflected a price to the producer far in excess of the auction price. For example, for the season, f.o.b. sales of properly packed and graded snap beans brought to the members of the cooperative an average of \$1.40 more per bushel than their neighbors realized on beans, good and bad, sold through the auction. This average was taken from the sale of 4,000 bushels of beans, which brought an increased return of \$5,600, or about two-thirds of the cost of the new equipment. Members of the cooperative were able to sell daily at a price reflecting a larger share of the consumer's dollar, and the influx of volume buyers to this market increased the f.o.b. prices as the season advanced.

The operation of small and large assembly markets throughout the fruit and vegetable producing areas of the State brought many requests from cities

in the State for assistance in locating sites and designing facilities for receiving markets, or terminals as they are commonly known. Raleigh, being centrally located, and served by four main U. S. highways going in all directions, and three railroads, was given first consideration because of the great need for a distribution point that could more efficiently and economically aid the farmers in marketing their products. Those of you who may be planning to assist in the development of a terminal market no doubt could benefit from the experiences of specialists who worked on the Raleigh project, which was completed last year. Service requests of this kind are seldom made by one group. As a rule, they are made by several groups vying with one another as to which group or individual knows the most about building a market and where the proper credit for getting the job done should be given. Success in sifting out and finding a group that is sincere and has no self interest is most likely to succeed in getting a market. This procedure involves, of course, meeting with various political subdivisions and civic groups until a committee is appointed to take the responsibility of carrying out the recommendations of the professional agricultural workers assigned to the project.

It should be pointed out that the surveys made before the actual market planning is one of the most important phases of the project. The evaluation of the results of these surveys by trained personnel actually is the stop or go signal for the undertaking. The financing of a project of this nature necessarily has to be on a down-to-earth basis; otherwise, the market will have failed before operations on it begin. The market revenue and expenses must be figured reasonably accurately, or the risk element in the investment would be beyond even a gambler's dream. The many time-consuming details that must be worked out and explained to the financial interests require patience and diligence, and sometimes become so involved that again the success or failure depends upon the continued hammering home of facts. And they must be facts--not assumptions--because usually someone will dispute everything said or done if it does not fit in with plans or selfish interests that he himself may have. However, the Raleigh Farmers Terminal was built by private capital and is operating successfully in spite of the adversities that were met in the years of planning before the market was built.

REDUCING COSTS OF MARKETING FRUITS AND VEGETABLES BY IMPROVING PROCESSING FACILITIES

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Perhaps I should begin by explaining that my company's activities are mostly concerned with the production of canned and frozen foods. These activities may be further refined to harvesting, cleaning, inspecting, washing, size or quality grading, blanching, filling and thermal processing (sterilization and cooking), labeling, and casing.

Canned food production has undergone remarkable advancements in the period since World War II. In sales volume alone, the big national canners have experienced outstanding growth. In the past 10 years, Campbell Soup has grown from 136 to 377 million dollars of sales, or a 270-percent increase; Heinz, from 114 to 234 million dollars, or a 205-percent increase; Stokley-Van Camp, from 90 to 159 million dollars, or a 177-percent increase; and Green Giant, from 20 to 48 million dollars, or a 240-percent increase.

Corresponding to this expansion period on the part of the national packers, there has been a reduction in the number of food processors. Those remaining have grown larger not only in sales volume but also in production facilities, new products and farm acreage. The Florida citrus industry was the first to experience the effects of increased production facilities and decreased unit costs with corresponding marketing advantages. As a result, there are no small frozen citrus concentrate packers in business today. Midwest tomato product manufacturers were the next to feel the effects of expanded competitive production, this time in California. In the last 4 years, more than 100 tomato packers went out of business in Indiana alone. Next in line appear to be canned pea and corn producers. In Wisconsin, an average of 5 to 6 medium-to-small pea and corn canners yearly are going out of business or selling their businesses to larger competitors. Now, there should be no feeling of frustration among food packers because of these trends; rather, there should be the excitement of emulation of those food producers who have been successful in overcoming the requirements of increased finances, expanded production, and greater sales. Although some of the mentioned companies are the biggest in their fields, bigness is not necessarily a mark of the successful, profitable food processor. Rather, the attributes of successful packers are farsighted management, sound accounting, imaginative research and engineering, cost and quality-conscious production, and aggressive merchandising. Although these consistently are found in the big successful packers, they are found equally in any size of organization.

A study of Wisconsin canners for the period 1946-50 is indicative of this fact. It showed that moderate-size plants producing 200,000 to 500,000 cases of canned goods annually, and with sales in the range from \$600,000 to \$1,000,000, made 3 to 5 percent more profit on sales and 10 to 12 percent more return on investment than smaller and larger companies. Furthermore, while 300 large companies in the nation with multiple plants sell 50 percent of the volume of processed foods, 2,200 companies with single plants sell the remaining 50 percent. It is plainly evident that there is plenty of room for both large and small packers in this expanding country of ours.

It is intended that my portion of this program point toward the most economical location, type, design, and size of processing facilities and the most efficient plant layout. Location of food manufacturing facilities must be related to the raw product, to the end product, and to the consumer market. Plant facilities must have available the usual adequate acreage, water, sewerage, and labor. Transportation of the raw product to the processing plant and of the finished food product to its market are critical cost factors.

Present pea harvesting costs have increased to a point where there is little profit in the product. Trucking charges in some operations amount to 50 percent of the total harvesting costs. This is not surprising, since an average acre of peas may consist of 5 tons of vines and 1 ton of peas, and processing converts these 12,000 pounds to 1,800 pounds of finished peas, or 3,800 pounds gross weight of cased merchandise. Corn bulk also is reduced through processing, whereby an average acre's yield of 6,000 pounds of green ear weight is reduced to 1,350 pounds of finished corn, or 2,850 pounds gross weight of cased merchandise. Likewise, 1,000 pounds of tomatoes in the field are reduced to 760 pounds of cased product ready for shipment from the warehouse.

Some other location factors are illustrated in the following examples. One of the first of the big five canned food packers built a fruit plant in central Michigan in 1955. Although the bulk of canned fruit is produced on the West Coast because of excellent quality and yields, the high transportation costs permit midwestern production of fruit which will be competitive at least for extra standard quality. The Michigan location has the advantage of placing production facilities adjacent to major consumer markets.

The recent shifting of canned pea and corn production is occasioned by entirely other reasons. Increasingly hot, dry weather and the spread of the corn borer have reduced corn production in the States of Ohio, Indiana, and Iowa. Although Illinois has not lost production, it has experienced a northward shift, with benefit to Wisconsin and Minnesota. In 1944, canned corn production in Ohio, Indiana, Illinois, and Iowa amounted to 33.3 percent of the total national pack, whereas in 1954 in these same States it amounted to 30.6 percent of the total. On the other hand, Wisconsin and Minnesota produced 39 percent in 1944 and 44 percent in 1954. Occasionally, some of the natural hazards can be overcome. In the case of the corn borer, adequate field programs utilizing new spraying equipment in combination with modern insecticides have tremendously reduced the incidence of in-plant contamination. When the job of controlling insects is done properly in the field, then plant labor costs for inspection and removal are reduced, with the plus factor of further elimination of contamination of the finished product. One Illinois plant in 1956 spent \$9,400 for sprayers and spray material, yet saved \$6,200 in direct labor alone for plant inspection and insect removal.

A new pineapple plant of major size is being built in Puerto Rico on the basis of availability of raw product, adequate labor market, practically negligible taxes, and government encouragement. Disaster protection against crop or labor failure in Hawaii is another plus factor.

A large American tomato packer has gone into Cuba to produce canned tomato products in order to protect that particular market. Another of the big packers has recently acquired the largest canner in the British Empire in Canada, as a means of expanding its own base of operation and protecting its Canadian consumer market.

Another reason for selecting multiple locations is that of disaster protection. National packers have plants in the East, Midwest, and West Coast to protect themselves against failure in any local area. One tomato packer has plants in New Jersey, Indiana, Illinois, Utah, and California. One national pea and corn packer has plants in Delaware, Pennsylvania, Illinois, Iowa, Wisconsin, Minnesota, Idaho, Oregon, and Washington.

In other cases, locations because of early market advantages permit promotion of a new seasonal product earlier than other areas. For example, one corn packer produces canned corn in the Texas area and merchandises not only in the southern market but also in the central midwestern market. Central Illinois corn is on midwestern grocers' shelves before Wisconsin's and Minnesota's; Illinois tomatoes are in the can and selling in advance of the California product.

Location and field operations are closely associated. There have been startling advances in fertilization, seed improvement, fungicides, insecticides and mechanization. An example of field mechanization is the use of the sweet corn harvester for canned and frozen corn. The year 1949 saw the use of sweet corn harvesters on a large commercial basis for the first time. From that time until 1956, their usage has increased to a point where this year 85 percent of the corn grown for commercial processing was picked with mechanical harvesters. One machine with one operator is able to replace 12 to 14 hand pickers. The economical advantage of the mechanical harvester, while only 32 cents per ton of corn on a national average, includes a 6-year depreciation rate for the picker. In addition to lower costs per ton of corn picked, the machines are able to glean as much as 300 to 600 more pounds per acre than hand pickers. Perhaps their greatest economic advantage is the streamlined production schedule which is now possible from field into the plant through the integration of radio-controlled trucks and pickers from a central farm headquarters. The dependence on the pickers has grown to be such that in most large field operations they are used 100 percent. The problem of securing laborers for field operations is increasing, as is the case in all other back-breaking kinds of jobs. The use of migrants from the Southern States, from Mexico, and from some offshore islands is well known. The cost of transporting, housing, and feeding these migrants is an enormous and a repetitive annual expenditure.

There is yet another aspect of this relation of availability of labor to location. The sardine industry is currently having severe labor shortages due to the population decrease in the Maine area and the undesirable nature of the labor itself. The older women who have been packing sardines are aging and dying. Younger women no longer like to do that kind of work. It is not a matter of the sardine canneries moving to areas of available labor supply. They are restricted in this respect to areas reasonably adjacent to fishing operations. Mechanization of many of their tasks not only is desirable but will determine whether or not American sardines can continue to compete with the European variety. So it goes when the laboring tasks are arduous and the wages noncompetitive.

One other general comment about availability of labor: It has recently been said that there are not enough women between the ages of 18 and 40 in the United States to handle the 1956 telephone requirements without the dial system. This is a good example to show that continued expansion is sometimes possible only through a combination of mechanization, or automation as it might be called, and more effective use of available labor. Where one man could unload empty cans at a rate up to 300 cans per minute, it is now necessary to implement manpower with automatic can-handling equipment for speeds at 1,000 cans per minute. Furthermore, population studies show that in 1965 there will be a decrease in the age group 25-39 from which a good portion of our labor force is secured.

After location of a plant facility, there is the matter of the structure and layout. About every size, shape, and conformation of building that the imagination could produce are used for food plants. Although the older-multi-story type is widely used, it appears that for new plant construction three types are standouts.

One is the single-floor, straight-line facility. In this instance, all equipment is located on one floor with only a modest elevation from the floor, perhaps only for easy clean-up and better sanitation. In this type of layout, the product must be handled somewhat more frequently by mechanical means through elevators and conveyors in order to be delivered to the next machine. Supervision is easy on a man-to-man or man-to-machine basis. It readily lends itself to consolidation of instrumentation and centralized panel boards.

A second type being used is the multifloor, mezzanine type. Generally, there is an open area in the central portion of the building from the floor to the roof which may be two, three, or four stories high. Floors of expanded metal or decking extend from the walls toward the open center. Piping, tubing, product-flow, and things which must move up and down between floors are handled through the open area in the center. There is some convenience for this reason and supervision, while not as good as the single-floor plan, is better than in the full multifloor plant where use of stairways and elevators is necessary for man-to-man contact and man-to-machine observations.

The third type, which is not used too widely but which has some advantages, is the so-called shell, which is nothing more than four walls and a roof, covering equipment which is set up in a three-dimensional plan identical with that of chemical or petroleum plants. One machine can be located in its best position in relation to other machinery with no imposition of limitations from flooring. Again, easy supervision of men and machines is possible. Operators have easy access from one machine to the other through catwalks and ladders at the most convenient locations.

Within the plant, there are two major cost reduction areas: (1) Labor-saving machines, and (2) increased yields. Evidence that these factors are being studied rigorously is the fact that companies such as Green Giant, Heinz, Campbell Soup, Stokely, Libby, and many others have established industrial engineering departments whose function is to study machine and processing advantages. Their calculated economic advantages are computed on the

individual company's requirements for return on capital assets. The industrial engineer's favorable recommendation of a machine is tantamount to its purchase. Because capital equipment is being analyzed and then purchased by more exacting scientific methods, equipment manufacturers can do no less than sell equipment on the same basis. In our own sales group, we have industrial engineers, chemical engineers, mechanical engineers, food technologists, and practical food production men who serve salesmen and customers alike.

The majority of equipment sold in the food processing field today is expected to return sufficient dollars to its users to set up a pay-off of 5 years or less. Occasionally, the period may be longer, but normally the pay-off must be under 5 years. In the case of the corn harvester already cited, the pay-off period is from 2 to 5 years, depending upon one's accounting procedures.

In one of our most recent developments, a new corn cutter is able to effect a 4- to 6-percent increase in yield. Based on a \$2,000 cutter cost, depreciated over a 10-year period, and assuming a 5-percent interest rate on investment, with green corn selling to the canner at \$18 a ton, this new machine will pay for itself in 2.64 years over one of our old machines. The relative advantage of reducing costs by increased yield or by labor saving may be especially pertinent to this group. The advantage of the new cutter over our oldest model amounted to a dollar product saving due to increased yield of \$4.71 per hour of operation. This compares to an operator's total cost of \$1.25 per hour made up of base rate plus fringe benefits. It is far more advantageous to increase yield than to eliminate the operator. From a machinery development viewpoint, it was simpler to increase yield of the cutter than it was to make a completely automatic operation out of the machine, which averages 125 ears per minute. This performance has had the desired effect, for corn packers have bought 1,000 percent more cutters in the last 2 years over the previous 2 years. The user is simply getting his money's worth as in any new sound capital purchase.

Another illustration of the relative advantages of increased yield over reduced labor is the case of fillers, whether they be for canned or frozen foods. Moderate-speed fillers are running at 300 cans per minute, with high-speed fillers running at 500 to 1,000 cans per minute. In a corn plant, the value of the product being filled at a rate of 7 tons per hour, or 300 cans per minute, and \$70-per-ton value at that point, amounts to \$490 per hour of product value being handled. Now, if there would be a net increase in yield by greater filler accuracy of only 1 percent, the dollar advantage would be \$4.90 per hour. Compare this with the \$1.50-per-hour figure for the operator on the combination filler and closing line. It would be almost impossible to eliminate the operator who is doing multiple duties in addition to controlling the speed and the start of the filler operation. Yet the dollar advantage is all in favor of greater filler accuracy because of the greater value of the product flowing through the machine. Thus, with only 1 percent savings in yield, a packer could afford to pay off a \$2,000 filler in 1 year, or with a 5-percent increase in yield, which is entirely reasonable, a \$10,000 filler could be paid off in 1 year.

Another illustration is reminiscent of the oft-quoted comment about the meat packer who recovers everything out of the hog but the squeal. This one has to do with the processing of tomato products. An average tomato cannery will pack whole tomatoes selected from their scalded and permit the unselected portions to be processed into juice, pulp, and paste. For these latter products, the chopped tomatoes are handled in pulpers which macerate and then express the liquid portion from the solids. The liquid subsequently is handled without concentration for juice, or it is concentrated to various degrees for pulp and paste. Meanwhile, the solids are removed from this same pulper to be disposed of as sewage or dehydrated for use in animal feed. A new press has been developed which takes these pulper leavings and puts them through a continuous pressure device which is able to recover, in an average plant, 2 gallons per minute of additional tomato juice. The additional juice value plus the savings in hauling costs amounts to \$30.75 an hour. On this basis, a modest-size tomato plant can recover the cost of a \$12,000 to \$15,000 press in less than one season's use. Of course, the savings continue after this point and permit a sizable return on investment.

Potato peeling is another common operation which has variable yields. Some typical recovery rates from batch abrasive peelers are 65 percent; from continuous abrasive peelers, 75 percent; from continuous lye peelers, 80 percent; and from continuous steam peelers, 85 percent. Numerous plants handle an average of 4 tons of potatoes per hour, 8 hours a day, for 200 days a year. At a value of \$25 per ton, \$160,000 worth of potatoes are processed per year. A new peeler which produces an additional 5 percent yield would return \$8,000 per year. If a company's requirement for return on capital assets is 2 years, which is reasonably severe, this potato line could support an approximate \$16,000 selling price, not counting taxes, interest on investment, or salvage recovery.

There are other less tangible cases of reducing costs. The selection of operators for different machines has its effect on cost. In the case of corn harvesters, one large packer who has more than 100 machines in operation finds that the average driver will do 20 acres per 8-hour day. However, there are a few drivers in the 30-acre-per-day class, and a few cover only 10 acres per day. These operators are paid on an hourly basis. Costs of direct labor per ton of corn are 53 cents for the 10-acre man, 26 cents for the 20-acre man, and 18 cents for the 30-acre man.

There are other operations where the dexterity of women gives them advantages over men. Where hand-loading or feeding of machines is employed, the use of premium hourly rates or piecework rates can be of real advantage. It is an established fact that where these practices are employed, the unit cost of direct labor is reduced, yet with higher income per employee.

Better utilization of existing equipment in plant expansion can result in greater economy where the line was previously out of balance in machine capacity. Many facilities grow up like Topsy, with little or no coordination towards some sought-after line flow. Either revised or new layouts provide reserves of raw product, containers, and supplies in order to maintain the

plant "on-stream." Some new food plants have reached a point of automation where, if all direct labor were eliminated, there would be only a slight improvement in their profit-before-tax position.

Before concluding, let us look ahead.

Today's planning becomes tomorrow's plant. Most managements are developing budgets expressing their needs and their income over 5- to 10-year periods. No longer are day-by-day opportunities the modus operandi of business decisions. Progressive, imaginative planning establishes the sales potential of present and new developments, based on the best sources of information and thought. The next step catalogs the requirements in time for: Additional capital, additional manpower of every important description, additional research programs and equipment, and additional plants and capital assets.

There is much to be done in food processing. The U. S. population will grow from our present 165 million to 195 million by 1966, an increase of 18 percent. In addition to the total growth, the increases over the last 10 years in per capita consumption of standard canned foods is at least 30 percent, and that of standard frozen foods 200 to 500 percent, while so-called speciality products or convenience foods, such as canned soups, meat and spaghetti products, frozen meat pies, French-fried potatoes, and fish sticks, have had phenomenal growth. Some were not in existence 10 years ago.

The era of canned or frozen prepared foods for the home kitchen and the commercial kitchen is only beginning. Most food processors are aware of these changes and are planning their budgets to capture their calculated share of these new markets.

CONCLUSIONS AND RECOMMENDATIONS ON REDUCING COSTS OF MARKETING FRUITS AND VEGETABLES BY IMPROVING PROCESSING AND DISTRIBUTION FACILITIES

The discussion of this subject brought out that with the shift to a buyers' market, buyers are insisting that growers of fruits and vegetables provide greater services and deliver a much more uniform grade and pack than was the case several years ago. It was further developed that in many instances local facilities for sorting, grading, packing, and selling these commodities are outmoded and do not provide the space and types of services for handling the volume necessary to attract large-volume buyers and to effect reductions in per-unit costs. These market conditions present situations in which State departments of agriculture can and should provide technical assistance not only in organizing groups of growers for the purpose of acquiring more modern facilities but also in helping them to determine just what their facility needs are, where they should be located, how they should be designed, and how they should be equipped. Several members of the work group related how they are called upon in their States to assist in developing farmers' markets in various cities and communities where the economic need and prospects for success may or may not exist. Marketing service people can

make a valuable contribution in these instances through surveys and studies to provide a factual basis for deciding whether or not to establish particular markets.

On the basis of the material presented and the discussion of the subject, it was concluded that improvements in facilities for processing fruits and vegetables present a highly specialized and technical field. It was pointed out that the large processors have developed their own technical staffs of engineers, food technologists, etc., to help management keep abreast of technological developments. The small or medium size processor, however, does not have the resources to provide these services for himself although, to survive, he needs them badly. It was concluded that State departments of agriculture in States where processing is of reasonable importance should consider seriously how they might go about providing such technical services to processors.

MILK AND DAIRY PRODUCTS
(Work Group Sessions)

REDUCING COSTS OF MARKETING MILK AND DAIRY
PRODUCTS BY DECREASING LOSSES IN QUALITY

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Opportunities to reduce marketing costs of dairy products by decreasing losses in quality are plentiful and diverse. They range from those of recent origin to others of the more distant past. Yet it is not an easy task for marketing service people to confine their efforts to a program selected as most suitable to the resources and personnel at hand.

We are confronted with the quality problems on the farm and those peculiar to transportation, processing, packaging, storage, and distribution. Innovations in both the production and marketing of milk, when applied without observing necessary precautions, may result in quality losses which decrease or nullify anticipated reductions in costs. Thus, unexpected conditions arise and call for immediate action.

Departure from a planned program may be necessary, and the problem may be too broad in scope for a single agency, or department, to undertake if maximum results are to be attained. Let us consider the handling of milk in Indiana as an example.

Farm bulk milk haulers. Bulk milk tanks were installed during the past 2 years on 3 percent of the farms in Indiana selling whole milk. This trend created the need for immediate training of farm tank-truck drivers, since the bulk handling system increased the driver's responsibilities beyond those of a mere hauler of milk. It was necessary that he qualify as an approved milk grader and observe specified sanitary requirements under State board of

health regulations. Additional grading responsibility was assigned him by the dairy plant--that of determining whether milk which complied with health requirements was acceptable on plant quality standards. A third requirement was that he determine the amount of milk and take samples for butterfat testing at the farm in accordance with the requirements of the State creamery license division.

Potential losses in quality due to inept grading are apparent in this situation, even though the bulk handling system generally enhances quality and reduces marketing costs. The situation was met by holding district training schools throughout the State. These schools were jointly conducted by State health, creamery license, and marketing service personnel under the sponsorship of the Indiana Dairy Products Association. Each agency had a well-defined field in the training of haulers. Marketing service personnel were responsible for the training on grading according to industry standards.

Training schools of this nature are more effective when conducted jointly by the various agencies or departments involved, rather than by a single agency. Indiana has made it a practice to hold similar district grading schools each year for all milk and cream graders.

Quality control at the farm level. Indiana farmers suffered a loss in 1955 of about \$200,000 from the rejection of milk and cream by dairy plants because of quality defects. An additional loss of about \$20,000 was taken by the milk haulers, since they are not paid for transporting rejected milk. Dairy plants lost the grading costs and the use of the product.

Furthermore, not all losses due to inferior quality are reflected in these appraisals. Some defects are not readily detected in the raw product, but become apparent during processing or in the end product. Others are detectable, but are not considered serious enough to warrant rejection of the milk or cream. The quality of the final product consequently is impaired.

The main approach to quality control at the farm is through the dairy plant and dairy fieldmen. Quality at the farm level is largely determined by the quality standards adhered to by dairy plants. For this reason, the fieldman is the best contact with the farmer. Direct producer education is left to the State agricultural extension service specialists with whom we work closely.

Fieldmen are aided in their work by district milk quality meetings. Formerly, Indiana held four meetings each month. They are now held quarterly, with one annual State fieldmen's conference. Through these meetings, the fieldmen are kept informed on current quality problems and the status of grading by the various cooperating plants. Guest speakers at these meetings discuss current developments of concern to milk producers. With 75 to 100 fieldmen attending each series of district meetings, through them large numbers of producers are reached.

Two cream quality meetings are held each month, one in the southern part of the State, the other in the northern part. They are attended by managers and procurement managers of butter plants. The meetings are devoted largely to cream grading policies and reports. One or more joint meetings of the two groups are held each year.

Quality in the finished product. Plant men are interested in learning from an unbiased source how their products compare with those of others. Indiana has had good responses from district clinics on cottage cheese and cultured and chocolate milk. These clinics are sponsored by the Dairy Products Association. Cottage cheese clinics preceded the sales promotional campaign conducted last March. A series of seven clinics on chocolate milk is now in progress preparatory to the sales campaign scheduled for February. Similar clinics are planned for butter, ice cream, and market milk. Annual clinics for the latter two products have been held for several years.

Twenty-one butter manufacturers submit samples of butter each month for examination. This includes (1) pH determination, (2) yeast and mold counts, (3) mold mycelia content, (4) composition analysis, (5) extraneous matter content, and (6) score of the butter. A complete report is made to the manufacturer on the basis of the examination.

Clinics and services of this nature provide plants with information which will enable them to take proper measures to improve the quality of their products. Composition control alone offers opportunities for large savings, particularly with reference to butter in regard to fat content.

Incidental losses. Previous mention has been made of the possibility that losses in quality resulting from comparatively recent innovations in the industry, when applied without observing necessary precautions, may result in losses at some stage of the marketing process. Similar in effect are various incidental practices in both the production and marketing of milk. The following experiences are examples.

In one case, several hundred gallons of milk were spoiled by the addition to it of milk from a single producer. The latter milk was contaminated with an ointment containing phenol and used externally in the treatment of the cows' teats. Traces of chlorine from a sanitizing compound in the mixed milk resulted in a chemical reaction, between the chlorine and phenol, producing chloro-phenol which imparted a very distasteful medicinal flavor to the milk. Salvage was undertaken by separating the milk and churning the cream. The flavor was intensified in the butter, resulting in total loss of the product. Also involved were expenses incurred by the attempted salvage of the initial product.

Similar losses have been experienced through the contact of phenol from cleaning compounds used on farms with chlorine from a sanitizer in the mixed milk at the plant.

In another case, algae in the plant water supply produced a phenolic compound which, combined with chlorine, resulted in a chloro-phenol flavor in cottage cheese and in a low-fat, high-solids-not-fat milk. The flavor was transmitted through use of the water to reconstitute nonfat dry milk used in the manufacture of the two products.

VERMONT'S MILK FLAVOR PROGRAM

Harold O. Clark
Vermont Department of Agriculture

At the Vermont Dairy Plant Operators' meeting in the fall of 1954, a committee was appointed to look into the matter of finding ways to increase consumer acceptance of milk. Commissioner of Agriculture Elmer E. Towne was chairman of the committee, and he turned the active operation of the committee over to Professor Alec Bradfield of the University of Vermont, who has done much research in milk flavor, and W. R. Dodge, Vermont's extension dairyman. With others on the committee, these two men planned a program which they announced at the Vermont Dairy Plant Operators' meeting in the fall of 1955. Under their guidance, a bulletin, "Good Tasting Milk," was published by the Vermont Extension Service and distributed to all dairymen in the State. In October and November 1955, they held 11 flavor-testing schools throughout the State that were attended by dairy plant operators, interested dairymen, and dairy inspectors from Vermont, Massachusetts, and New York.

Following these events, the milk of all producers delivered to almost every plant receiving milk in the State was scored for flavor. This testing was done by teams of three, consisting of an inspector, a plant quality man, and a farmer who delivered milk to the plant. The milk was graded "Good," "Fair," or "Poor," and all producers were notified of their grades. During the winter, this scoring was done three times in a large number of plants, and a great deal of interest in the program was built up. Most dairymen in Vermont are supporting the American Dairy Association and the New England Dairy Council. Those whose milk is retailed in Vermont also support the Vermont Dairy Council. It was easy for them to understand that excellent flavor would help sell more milk.

On June 1, work was begun on a matched-fund project to promote and coordinate a continuous milk flavor improvement program throughout the State. There are three definite approaches to the problem. The Dairy Division of the University of Vermont does all kinds of research concerning what contributes to undesirable flavors. The extension dairyman and the Vermont Extension Service do all the instructive and promotional work possible among dairymen. My job is to get the milk of all Vermont producers tested for flavor regularly and get corrections made when it is found less than good.

There are regular bacteria counts at all plants, but taking larger samples and tasting for any off-flavor became part of the regular laboratory procedure. I have worked with laboratory technicians and, wherever necessary, have trained them to grade milk for flavor. They do not name the off-flavor but merely decide if the milk is pleasing to taste or unpleasant to taste. They classify the flavor as "Good," "Fair," or "Poor." The persons doing the tasting record the information on forms, in triplicate. When the samples have all been tasted, the original sheet is torn off and filed at the laboratory. The duplicate and triplicate are turned over to the quality fieldman, and he visits all producers whose milk scores less than good. He and the producer discuss the possible reasons for the off-flavor and usually decide what is wrong and correct it. After the fieldman has obtained corrections, he makes notes on the column "corrective action taken" and forwards one copy of the report to me. This serves two purposes: Some information is gained from the fieldmen's reports, and it is a means of trying to make sure that they do take corrective action. After all, no purpose is served unless the off-flavors are corrected.

Going back to the laboratory procedure, normally the samples are smeared for a Breed count or plated raw and then laboratory pasteurized, and a laboratory-pasteurized plate count made. Then the samples are either tasted or put in the refrigerator and tasted the following day if more convenient. In this way, the samples are pasteurized for safety, and they more nearly duplicate milk as it reaches the consumer. During laboratory procedure, the taste of the samples may change due to exposure to light. Amber glass vials with a 30-cc. capacity are being made for bacteria and flavor samples. The amber glass resists the action of light on milk, and 25 cc. of milk in the 30-cc. vial is enough for both bacteria counts and three 7-cc. tastes of milk. At least two persons taste the samples as a check on the accuracy of the results.

I would like to make further comment about the amber glass. I am sure that we need it for the laboratory vials. I am sure amber glass is as badly needed for all milk that is sold in glass, especially homogenized milk, as for the laboratory vials. A quart bottle of homogenized milk that has been in the sun for 20 minutes has a distasteful flavor, and a lot of milk gets that much abuse. The breweries are using colored glass bottles for beer and ale almost exclusively, because light changes their taste. The milk industry is a long way behind in this respect. We have demonstrated the effect of light on milk in clear glass gallon jugs in the display cases of food stores with milk in amber glass under the same conditions. The results of this comparison were demonstrated to all of the major milk dealers in Boston. Several dealers in Vermont are using amber bottles for homogenized milk, and it is hoped that eventually the gallon jugs in Boston stores will be converted to amber glass. Actually all milk bottled in glass should be in amber glass.

Now, let us turn to the problems that confront producers who try to make good-tasting milk.

First, during the season that cows are in the barn, stables need to be ventilated sufficiently to keep odors of feed and manure from being noticeable. In the northern climate, this is difficult because dairymen like to keep the stables warm enough to do chores in their shirt sleeves. The argument in this case is that more ventilation not only will result in better tasting milk, but the cows will give more milk in a somewhat cooler stable with more fresh air.

During the barn feeding season, feed flavors are a serious problem. The green pastures program has taught producers to make grass silage in addition to corn silage, and a much larger percentage of the feed is liable to cause an off-flavor than was true a few years ago. If a cow has eaten silage or other feed with a strong taste or odor shortly before milking, the flavor is noticeable in the milk. If she has eaten a large meal of it 3 hours before milking, the taste of the milk is very undesirable. The cows should not have access to feed of this kind for at least 4 hours before milking. Also, it should not be in the stable, as the odor, in some measure, will cause the same taste in the milk. It is hoped that control of the odor of the silage will remove part of this handicap.

During the pasture season, many things can cause an undesirable taste in milk, but generally they are not as serious as the silage in winter. The same rule holds true, that cows should be taken away from lush feed 4 or more hours before milking. This is more difficult to control than the winter feeding. This year, during September, feed flavor in the milk of quite a number of Vermont producers was evident.

The other major milk problem is rancidity. This is usually from cows late in lactation. It is particularly serious because it makes other milk with which it is mixed also rancid. This condition is aggravated or promoted by agitation such as the agitation of milk in pipes above a rotary pump for getting milk from a dump tank when the pump is running idle. Producer samples from a large receiving station's milk tank containing the entire day's delivery tasted as bad as the milk from the few worst deliveries. The answer to this problem seems to be to try to have each producer make sure that each cow is dry 8 to 10 weeks before freshening and that the milk gets no unnecessary churning in handling.

Bacteria counts have been supervised closely enough that they cause only a minor part of the flavor troubles. For 20 years in the Northeast milkshed, quality control officials have required that producers deliver milk of low bacteria count, and any producers who are a problem are excluded from the market until the bacteria counts are satisfactory.

The problems in this field somewhat follow a pattern. July is quite free from them. August finds some cows late in lactation, thus causing rancidity in milk, but it does not get as serious as in the winter. In September, green-pasture feeding causes a noticeable flavor in the milk. In November, barn feeding of silage is the major problem, and it does not diminish until turning-out time again. In addition, rancid milk is at its worst in December and January, and insufficient ventilation complicates the problems all of the time that the cows are kept in the barn. Vermont has a little over 10,000 commercial dairy herds, which produced more than $1\frac{1}{2}$ billion pounds of milk in 1955. About two-thirds of it is sold for fluid consumption. Under the Federal orders, the fluid sales bring a much higher price than milk that is used for manufacturing purposes. The success of this program depends on that fact. It is good business to try to produce an excellent-tasting milk if the financial returns are greater. In the first half of 1956, each producer received \$75 more than during the corresponding time in 1954 and \$42 more than the same period in 1955, due to increased fluid milk sales. Part of the increase was brought about by the improvement in flavor that has already been made.

Six hundred producers supply the milk used in Vermont. The other 9,400 supply most of the milk used in Boston, some in southern New England, and a little in New York markets. The milk sold in Vermont is handled by 120 retailers, with an average of 5 producers each. Their milk is tested mostly for bacteria and flavor at the Vermont State laboratory at Montpelier. The milk shipped out of the State is handled in 83 shipping stations, and the flavor is tested in the laboratories of the different milk companies.

The program is entirely voluntary, and its success depends upon promotion, friendly insistence, and getting all plant men and producers aware of its actual value.

Not long ago, I was not quite satisfied with the taste of milk served me in a Vermont restaurant. I watched the customers carefully. Although many people ordered milk, no one ordered a second glass. The next day at lunch in another restaurant, the milk was excellent. I watched carefully again and quite a lot of people ordered a second glass, including myself.

These incidents demonstrate what we are trying to accomplish and have given me a new definition of our three flavor grades:

Good = You want a second glass.

Fair = You just about finish the first glass.

Poor = You drink only part of the first glass.

The incidents also show that a milk dealer is not facing the situation squarely when he says he has no complaints or almost no complaints. Customers complain only if milk is seriously off-flavor. When milk is fair, they usually do not realize that it is less than good but do not drink so much of it.

When it is excellent, they are apt to recognize that it is a delicious beverage and drink more. This is true of adults and, to a much greater degree, of children. Their sense of taste and awareness of off-flavor is considerably more acute than ours.

If excellent milk is served, not only will sales increase now, but children who enjoy milk now will become lifelong milk drinkers. Adults or children do not drink milk because it is good for them. If they drink the amount they should, it is only because they enjoy it as a beverage.

It is our job to make sure that milk IS a delicious beverage.

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING MILK AND DAIRY PRODUCTS BY
DECREASING LOSSES IN QUALITY

Service work aimed at decreasing losses in quality goes beyond the requirements of regulations. It was brought out in the discussion that the main emphasis is on helping farmers and plant personnel recognize poor quality, identify the cause, and learn how to correct the trouble. Some of this service work is entirely separate and apart from the enforcement of regulations. In other States, the same men work on both aspects of the problem.

How much emphasis to place on facilities on the farm, as compared with the quality of the milk delivered, is an important decision. Most of the discussion favored putting the most emphasis on the quality of the milk itself. On the other hand, a minimum of facilities is needed to insure proper handling of milk.

In discussing the relationship between milk inspection and quality improvement, the relationships among several agencies frequently are important. Responsibilities are variously divided among the agriculture and health officials of the States. Local health units operate with differing degrees of responsibility to State standards and officials. Milk supplies destined to move interstate may be subject to multiple inspections, which could be avoided by developing working relationships of a reciprocal sort.

Bulk handling of milk on farms is bringing quality problems, particularly involving new responsibilities for milk haulers. Butterfat sampling is one quality measurement which has been complicated by bulk handling.

Butter presents one of the more acute quality problems among dairy products. The solution adopted in several States is either to prohibit sales of butter below a specified grade, or to require consumer packages to show the grade, or both. Among other dairy products, quality programs are being used, with or without stricter legal standards. There were reports of work on ice cream, cottage cheese, and dry milk. It was felt that there is a trend toward wider use of minimum Grade A standards on a Statewide basis, with some

prospect of their application eventually to all milk irrespective of its intended use.

The group recommended that such programs as those described for Indiana and Vermont should be expanded in States now using them, and should be adopted in additional States.

REDUCING COSTS OF MARKETING MILK AND DAIRY PRODUCTS
BY IMPROVING HANDLING METHODS AND EQUIPMENT

Richard Hoyt
National Milk Producers Federation
Washington, D.C.

Before discussing some of the progressive developments in the dairy industry, I would like to remind you that the National Milk Producers Federation stands ready to assist all segments of the dairy business in any way that it can.

The butter industry has been quick to accept the recently developed metal churns which include: (1) Provisions for controlling temperature with sweet water, and (2) doors which, by elevating the churn somewhat, permit the butter to be dumped into a sanitary cradle. The dumping saves time by making the churn immediately available for the next batch of cream and allowing the boxing to be done simultaneously with the churning of the subsequent batch. Since the butter granule temperature can now be controlled, the necessity for chilling butter by washing the granules with refrigerated water can be eliminated, saving the time and reducing the possibility of off-flavors originating from the psychrophilic organisms that may have been water-borne. These churn installations reduce time and labor and can be expected to reduce substantially the plant operating cost. The latest reports indicate that the keeping quality of unwashed butter is excellent and that no significant differences from washed butter are noted by competent graders.

The fabricators of milk drying equipment have developed new, more efficient, stainless steel cyclonic separators which reduce the stack losses due to excessive fines. Collection of dependable figures measuring drying plant losses are difficult to obtain, but if the pilot operations can be considered as valid criteria, we can expect to be able to reduce these mechanical losses to 1 per cent or less. There is a real need to complete the work on particle size and dispersibility of nonfat dry milk in the standard primary spray drying equipment to eliminate the necessity for the secondary rehydration and redrying of the product destined for consumer packages.

One of the labor problems in drying plants has been the warehousing and loading of the bags, barrels, and boxes, a chore which pads the payroll with a standby force. Plants which have adopted the fork-type, self-propelled lift truck and standard palletizing have been able to reduce their demand for labor. The designing of dairy product flow has required investment in several separators and complicated sanitary piping in order to synchronize flow rates. One of the very new pieces of equipment being offered is a separator with twice the capacity of former models, permitting the less complicated use of one machine. To accompany these higher capacity separators, there is an efficient cleaned-in-place separator-parts washer which eliminates the time-consuming hand washing of discs.

Although they cannot be considered recent, thermostatic water baths for both samples and tests, thermostatic control of the added water, and efficient reading devices are being fabricated and offered. These were developed because of the need pointed out by a committee of the American Dairy Science Association.

Better shaking devices and test bottle washers are available to complete a line of accessories for Babcock testing. This coordinated equipment may not save time, but will improve accuracy, and it is now possible to standardize this procedure so that there can be a high degree of credence in fat tests.

Granting that health departments have not universally accepted the method, several companies are offering centrifugal spray apparatus to clean bulk tank pick-up trucks in place. The general opinion is that this apparatus is successful and eliminates the most universally hated task of dairy workers, that of climbing into a wet, slippery tank for hand brushing. The system is closely related to the one now used to clean vacuum pans by circulation, which has proved to be efficient and economical.

In recent months we have been privileged to have a part in planning operations of both marketing organizations and co-ops in fluid milk operations. There is general recognition that costs have risen, partly because of circumstances not under control of these organizations and partly because calculated savings have not been captured. The increased cost of producer field work has been the cause of a great deal of concern and discussion in both types of marketing associations. There has developed a critical interest in the effectiveness and cost of producer field work by both marketing people and regulatory officials. This interest has been inaugurated largely by the realization that these costs are becoming burdensome to the extent that marketing operations will be penalized. The present level of activity in the field has been reached by the pressure of the transition to bulk tank procurement, accelerated programs of regulatory agencies, and available milk supplies large enough to permit selection of quality producers. The producer has two reasons for his interest in bulk tank methods: The first, to insure that he will have a ready market; the second, to maintain his gross income by increased production with as little demand as possible on the time required

for other farm chores. Survey and installation of bulk tanks has pulled the field personnel from the primary tasks of quality control. Regulatory officials, finding that the limits of standards are being exceeded, have insisted that personnel be increased with its attendant additional cost.

If the activities of producer field forces prior to the appearance of bulk tanks are examined, the conclusion will be readily reached that the problems were those of obtaining supplies and that the mere possession of a Grade A permit was practical insurance of a market. At that time, the emphasis by health authorities was mostly to obtain compliance with the physical requirements for farms. To maintain bacterial standards, reliance was placed on the effectiveness of routine farm inspections. As facilities were made available to sample frequently consumer packages of milk and dairy products, the fact became apparent that inspection alone did not effectively maintain compliance with the bacterial standards. Today's supermarket, wider distribution, and the 5-day week, necessitate longer shelf life, which can be accomplished only by control of types of bacteria. The combined costs of this field work have been steadily increasing, enough to lessen the savings that should accompany bulk tank procurement. Although it is true that procurement costs are dependent on the amount of industry participation required by the various regulatory agencies, the associations and plants who have established laboratories with approved procedures and made their field programs laboratory-actuated have in general been able to hold their field costs in line. Where the need for field work can be pinpointed by the screening techniques for thermophilic organisms recommended by the American Public Health Association, travel time and unnecessary routine are reduced. If we are to keep these costs in line, more dependence must be placed on these techniques. There will be other burdensome problems requiring laboratory solution to assist field men. At the moment residual antibiotic in milk could place some real demands on the time required for this type of work. If the direct count of nonfat dry milk is incorporated in the new standards, field service to manufacturing grade producers will have to be increased, creating the same conditions for our drying plants.

The trend toward consolidation of plant facilities has become especially important in fluid milk processing and distribution. The high cost of labor, the demand for equipment of the automation type, increased requirements of fixed facilities not dependent on volume, the paper container, greater procurement area of bulk tank pickup, and the wider distribution afforded by modern facilities and advertising media have accelerated the trend by both outright sale and merger. As the capacity of processing equipment is increased, there are comparatively large savings in investment and labor. There are, however, some offsetting factors.

With the trend toward combining operations requiring higher speed equipment, the need in the industry for the lesser capacity apparatus declines and reduces the salvage value of the equipment no longer needed by the consolidated unit. The labor cost in these combined operations has not always been reduced in the expected ratio. Providing that the procurement and raw milk storage facilities are adequate to insure the continuous pasteurization

of the day's needs for packaged milk, a high-temperature, short-time unit with its companion homogenizer and standardizing clarifier will net a desirable unitage per man-hour. Several time studies of actual operations have shown that up to this point costs appear pretty generally as they have been anticipated.

The items companion to fluid milk, such as cream, half and half, chocolate milk, and buttermilk, have not always shown the expected cost reduction. In nearly every such case, there has been either inability or unwillingness to apply the same engineering standards and equipment investment as that employed in the handling of bottled milk. The standardizing clarifier has replaced the blending vats in the fluid milk department; however, regardless of whether the same or auxiliary plate equipment is used for these byproducts, adequate blending vats are a must if processing these items is to proceed on schedule and not delay the packaging operations. Some of the medium-size plants have attempted to compromise the blending vats required by processing different items on prior scheduled days of the week. Shelf life and inability to project sales needs usually disrupt this schedule and cause many overtime hours. In order for blending or standardizing to be completed in time to synchronize the byproduct packaging, independent separating operations will have to begin and be completed prior to the need for skim and cream.

The engineering required to correct the deficiencies in schedule after the original consolidation of facilities has taken place has proved rather costly in some instances. If these mergers are to function as planned, the need to provide for growth and for the projection of operating time schedules is apparent, indeed, giving consideration to the necessity for a 5-day-week operation.

We need to become close to all the details from farm to consumer, appraise the new constructively, and, probably most of all, get rid of the things that do not work. Those who are mindful of consumer demands and competitive practices, and use their laboratory facilities to audit their techniques, are progressive and have efficient costs.

REDUCING COSTS OF MARKETING MILK AND DAIRY PRODUCTS BY IMPROVING HANDLING METHODS AND EQUIPMENT

Donald E. Hirsch
Dairy Branch, Farmer Cooperative Service, USDA

This is an appropriate time to consider ways and means of lowering the costs of marketing milk. Owners of dairy businesses--whether producer-patrons of a cooperative or investors in another kind of firm--have always been keenly interested in increasing their returns by lowering costs. But we are now in a highly competitive period in which most dairy businesses must either become efficient or perish.

Dairy farmers--like most other agricultural producers--have been plagued by "surpluses" of farm products and by limited bargaining power in negotiating prices for the products they sell. This is an era of organization, and many closely knit, vocal groups seek more favorable places in the economic sun.

How, then, can we help the dairy farmer attain a standard of living comparable to that enjoyed by others in our economy? One approach is to help him help himself by organizing or maintaining an efficient cooperative wherever there is an economic need for it. A second approach is to increase the efficiency of all marketing firms in the hope that at least a part of the savings will be returned to him. The latter approach is the one with which we are concerned today.

Is there cause for concern about the level of payments to dairy farmers? Let us take a moment to look at the overall margin situation.

In 1955, the total retail cost of dairy products in the United States was estimated to be 8.5 billion dollars. Of this, 3.9 billion went to farmers and 4.6 billion to meet the costs of marketing (1). 8/ In 10 years--1945 to 1955--the farm value had risen 50 percent, while the marketing margin had risen almost 110 percent.

In order to increase payments to farmers, we must have either an increase in the total outlay by consumers or a decrease in the marketing margin. We are concerned at the moment with the latter.

Some of the increase in marketing margin has gone to meet the cost of tailoring the product to fit the needs or desires of consumers. Potential savings here are small; these service costs probably cannot be greatly reduced. A more fruitful field of endeavor is marketing efficiency. And improving handling methods and equipment is a big part of that field.

The theme of this workshop is "How State Marketing Service Agencies Can Assist in Reducing Marketing Costs." Many of you are concerned with that problem on a day-to-day basis. In order to meet such an objective, you must be familiar with the results of research studies dealing with the costs of marketing milk and other dairy products. I shall spend the rest of my time trying to flag for you a few recent, important research studies, and their major findings, that relate to milk handling methods and equipment.

8/ Numbers in parentheses refer to a list of references at the end of this speech.

If we think of milk handling in a broad sense, one of the first things to come to mind is the definite trend toward fewer and larger plants and organizations. The basic cause of this development is the competitive advantage which a large dairy plant usually has as compared to a small one. Of course, we all know that an efficient small plant can whip an inefficient large plant, but the balance of power usually falls on the side of the large plant. When we say "large plant," we are, of course, referring to a plant with a large volume. But a plant of any size that has a good deal of excess capacity in relation to its volume is a high-cost plant.

A number of the studies from which I shall quote have been concerned with the advantages of large-scale operations. Few publications have reported on the "why" or "how" of the mergers or consolidations that have frequently been the means of obtaining larger volumes. Similarly, we find little published information on the relative merits of diversification or flexibility as compared to specialization in production. An exception is a recent Oregon report which stated that:

"Total manufacturing costs, deducted from finished product values at the plant, show net returns for the period 1947 to 1953 were higher in specialized butter-powder than specialized cheese or flexible plants." (2)

Now let us look at the procurement of milk and work through to final distribution of the finished products.

The "glamor" phase of the dairy world is bulk tank pickup. Under certain conditions, savings are possible on farms, in hauling, and in plants. Here are some of the principal findings of a recent study of bulk hauling costs that was made in the Farmer Cooperative Service of the U.S. Department of Agriculture:

"Under specified conditions representative of those in many areas, a can truck traveled 1 mile for each hundredweight of milk hauled compared to .86 mile and .57 mile on the daily bulk and every-other-day bulk routes, respectively. This reduced mileage requirement meant a saving in truck operating cost of 3 to 5 cents per hundredweight by converting to bulk pickup....

"Potential savings are greatest when relatively large-volume producers are served by the bulk routes. Substantial savings are possible, however, when the average daily production per farm ranges from 300 to 500 pounds, a level typical of fluid milk markets today....

"Best chances for savings occur when bulk trucks serve each farmer every other day. Reductions in hauling costs on bulk routes providing daily pickup service are not probable in serving producers of the size prevailing in most midwestern and eastern markets....

"Bulk routes need to be efficiently organized and operated to produce maximum savings. During the conversion period, it is important that these routes be flexible. Otherwise, interweaving bulk routes will increase bulk hauling costs." (3)

Moving now to the dairy plant, one of the first things to consider is a proper environment for efficient handling methods and equipment. A fact-filled Idaho report meets the following objectives which were set out for it:

- "1. To demonstrate the importance of building planning and proper selection of materials to reduce manufacturing costs.
2. To explain specific building problems and present solutions to them.
3. To describe the modern dairy building so that the relative importance of the cost of the dairy building in relation to its size can be determined." (4)

Now let us look on the inside of the dairy plant and, more specifically, at handling methods and equipment. An intensive study of milk receiving plants in Vermont led to the following conclusions:

"Many of the improvements which are needed in receiving plants and which would contribute to their efficiency are relatively inexpensive. Extension of a conveyor line, grading to permit small haulers to unload easier and faster, adjustment of slope of conveyor at dumping arch, some understanding of body mechanics, etc., are but a few of the many opportunities for improvement which were noticed in this study. Each plant needs an objective check on its present operations; then special recommendations should be made in line with its particular problems." (5)

An Indiana study that also related to milk receiving, but with even greater emphasis on labor utilization, resulted in the following suggestions to plant operators:

- "Plan for efficiency regardless of plant size.
- "Use a small crew where possible.
- "Erect or maintain adequate--not excessive--capacity.
- "Utilize nonoperating periods.
- "Balance equipment and labor.
- "Keep equipment in repair.
- "Distribute labor evenly among workers.
- "Schedule country trucks.

- "Let one can drain while removing lid from next.
- "Work sampling equipment into compact work area.
- "Dump weigh tank while doing other work.
- "Combine two or more jobs where possible.
- "Check your washer speed.
- "Keep conveyors repaired.
- "Receive at least 15,000 pounds per man hour.
- "Keep system flexible." (6)

One of the most important operations performed in milk receiving is butterfat sampling and testing. There are several reports available that can help in developing sound butterfat sampling and testing programs. One of the most concise reports was issued in 1956. (7)

Looking at the overall efficiency of milk distributing plants, an Illinois bulletin states:

"The study indicated that the greatest opportunities for improving milk-plant efficiency appeared to lie in: First, increasing volume; second, modernizing the layout of the plant; third, introducing modern equipment; and fourth, limiting the number of products handled.

"Efficiency in the use of labor tends to increase as volume increases....

"Volume alone, however, is not a dependable measure of efficiency....

"Labor is usually the most costly factor in any paper-container plant, other than the cost of containers and bottler rentals....

"Space costs per unit are small in many milk plants....

"Unit costs of equipment are usually higher in plants handling only a small volume than in plants handling a larger volume." (8)

A study made at Cornell of labor utilization in small milk bottling plants found that the following contributed to efficiency:

- "1. Good arrangement of buildings and equipment--to provide for the minimum amount of sanitary pipe and fittings, a minimum of travel by workers in the plant, and adequate working space.
- "2. Equipment of suitable type and capacity--special attention should be given to ease of cleaning and to the proper coordination of equipment throughout the plant.
- "3. Efficient work methods--i.e., ways of performing the various tasks with the least time and effort.

- "4. Careful scheduling of work--to provide for the fullest possible utilization of the time of each employee at productive tasks.
- "5. Adequate incentives to workers--to stimulate maximum interest and effort on the part of each employee.
- "6. Good managerial supervision--in addition to providing the foregoing conditions favorable to high labor efficiency, the management should give new employees proper training for the tasks assigned to them and endeavor to maintain good employee-management relations." (9)

Operating cost figures are a little hard to listen to so I shall not present an array of numbers. But if you want to find out how total volume, surplus handling, byproduct processing, and combining or separating glass and paper packaging operations affect costs in milk distributing plants, you will find a recent Virginia report of special interest.(10)

A study completed in the Farmer Cooperative Service gives cost data for cooperative milk bottling plants in Georgia, shows how they are related to volume, and presents unique method of accounting for all milk solids when computing unit costs. (11)

Still another study, reported in a Utah publication, had the following findings:

"Increased processing efficiency, a greater variety of products, and improved quality can be obtained in at least two ways by managers of small, local plants, (1) through internal operating improvements, which enable plants to utilize labor and equipment more efficiently, and (2) by enlarging volume to utilize more fully existing facilities and obtain advantage of labor specialization." (12)

The Agricultural Marketing Service and the University of Georgia are now cooperating in a project designed to develop a model milk distributing plant. I understand the field work has been completed, and analysis of assembled information is under way. The final report should be of considerable interest to all persons concerned with efficiency in fluid milk plants, but particularly to those who work in the Southeast.

Manufactured dairy products appear to have been the subject of fewer cost studies than fluid milk in recent years. If you are interested in dried milk costs, however, a recent Minnesota report will be of value. (13)

The results of a very intensive study of operating costs of western butter-powder plants are given in a report issued by the University of Idaho. (14)

Of special interest to those concerned with the production of American cheese is the following:

"A new, short-time method for making Cheddar cheese from pasteurized milk was developed and described by the U. S. Department of Agriculture in 1953 (BDI-Inf-158). It required only 2-1/2 hours from the time the rennet was added to the milk until the curd was pressed, instead of the conventional 5-1/2 to 6-1/2 hours. Furthermore, packing, cheddaring and milling the curd were eliminated. Thus, the time and amount of hand labor required in making cheese were greatly reduced. There were, however, recognized objections to certain parts of the method. It required special types of cheese-making equipment. Also, approximately one-half of the whey was unusable because it contained 4 percent added salt. These objectionable features have been eliminated for the most part through the development of a simplified short-time method that can be used with conventional cheese-making equipment, except for minor changes in the hoops and hooping equipment. Less than 10 percent, or none, of the whey is lost." (15)

These are some of the most significant of the recent research findings that can aid you in helping operators reduce handling and equipment costs in plants. There also are many reports that deal with out-of-plant handling and equipment costs. Some of those you may find most interesting relate to the demand for fluid skim milk (16), quantity discount pricing of bottled milk (17), trends in fluid milk sales and containers (18), outer-market distribution of milk packaged in paper (19), milk vending (20), effective selling of milk (21), and merchandising dairy products in stores (22).

You will need also to keep abreast of developments so new that we do not yet have in published form the results of intensive or extensive research studies. A highly concentrated form of fresh milk, that will keep for a long period of time, may be "just around the corner." New packages are being developed; the Swedish Tetra Pak is now on trial in this country. Many other innovations are either here or on the way.

Product and marketing research will continue to pour out new techniques and equipment in a rushing flow of information. You who serve farmers by working in State departments of agriculture face a real challenge in steering that information into productive channels. I am sure you will continue to meet that challenge.

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CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING MILK AND DAIRY PRODUCTS
BY IMPROVING HANDLING METHODS AND EQUIPMENT

Milk marketing plants have available accounting methods and services that compare favorably with those of other food processing industries; but many dairy plants, particularly smaller ones, fail to pay sufficient attention to unit costs. The cost problems are difficult because of the variety of items normally produced. When new methods and practices come along--such as paper containers, gallon jugs, bulk dispensers, etc.--it is hard to reach sound conclusions as to their overall effect on costs. Many of these new methods are hard to evaluate cost-wise because they are so often coupled with price wars and competitive tactics which may have little to do with the cost of the method.

The group discussed such factors affecting costs as types of containers; bulk assembly; 2-shift operation; 5-day week; receiving-room efficiency; polyethylene bags for bulk cream, ice cream, cottage cheese, and buttermilk; and home dispensers.

Service work to aid in solving such cost and efficiency problems of milk plants must take into consideration the highly individual character of organization, plant layout, and equipment in each plant. Few general recommendations can be made. There is room for service by technically qualified men in a position to analyze plant problems and offer disinterested advice and suggestions for improvement.

Existing programs, and the evident interests of those taking part in the meeting, indicate that current emphasis is more largely on problems of product quality, business practices, and the promotion and merchandising of milk and dairy products than on efficiency of methods and equipment.

THE MONTANA QUALITY PROGRAM FOR DAIRY PRODUCTS

Thomas A. McMaster
Montana Department of Agriculture

Montana ranks forty-first in the Nation in milk production. Its butter production is less than 6 million pounds; ice cream production, $2\frac{1}{2}$ million gallons; cheddar cheese, $3\frac{1}{2}$ million pounds; and cottage cheese, $1\frac{1}{2}$ million pounds. Therefore, I realize the splendid opportunity that I have in working with specialists from States in which probably one plant has a volume equal to or in excess of Montana's total dairy production. I am somewhat embarrassed to discuss the findings of our program from the standpoint that this program could be equally applicable to States with a much greater milk production.

Our project under the marketing service program was started in January 1955. Its primary purpose was to help improve the quality of butter, ice cream, and cottage cheese. Results from this program are becoming more evident each month, not only in the improvement in the quality of the dairy products but in the elimination and consolidation of processing plants. Monthly reports on bacteriological flavor, keeping test, and composition analysis, returned to plants on the rating of their products, seemed to arouse the interest of management and plant personnel particularly after the fourth report. This interest became evident when inquiries were received due to delays in getting reports back to the plants.

In many cases where the quality of dairy products was rated poor in consecutive reports, we were consulted for information on how better quality products could be obtained. Generally speaking, the answer was not difficult because the common cause was poor raw materials and insufficient volume to enable the plants to grade and process more frequently. To remedy this condition by stricter grading of raw materials would reduce volume and increase labor costs if more frequent processing were carried out.

Once the plant operator became conscious of the poor quality of his products, our continuous grading program was really effective. Many operators realized that, to continue in business, the quality of products bearing their label would have to be improved to at least equal, if not exceed, the quality of their competitors' products. Improvement in this situation, which was largely due to being located in areas of low production, would be difficult and costly. Therefore, the logical step was for these plants to obtain their products from another plant through direct purchases or by consolidation of their operations. Both methods were used in several instances. On January 1, 1955, 56 plants were manufacturing butter. On November 1, 1956, the number had dropped to 40, and it appears that in the near future the number will be about 32. On January 1, 1955, there were 59 wholesale ice cream plants. On November 1, 1956, the number had dropped to 53. Here again it is evident that this number will decrease further. On January 1, 1955, 20 plants regularly were manufacturing cottage cheese, and at least 7 more at irregular intervals. In November 1956, only the 20 plants continued to manufacture this product. Here again poor-quality cheese and scarcity of raw material will reduce the number of manufacturers.

Of the plants that discontinued the manufacture of butter, ice cream, or cottage cheese, all but one are still operating as dairy plants, but they obtain one or more of their products from other plants.

Plants that consistently have poor-quality products, as shown by our quality improvement work, constantly are reminded of this fact by letter or personal call to get the operator to remove the poor-quality product from the market. Although this procedure may not be regarded as a scientific approach to the problem, it is a practical way to get results. Plant operators are in business to make a profit, and oftentimes quality is of secondary importance. However, I believe that quality is more important in the success of a dairy plant than of most any other food processing plant. Also dairy plant personnel

are more conscious of the importance of sanitation and quality than the personnel of most any other industry.

In carrying on the project on quality improvement in Montana, samples of butter, ice cream, ice cream mix, and cottage cheese are picked up each month at the dairy plant or retail store. The dairy plant has no previous notice of the time the samples will be picked up or whether they will be picked up at the plant or at the store. The samples are carefully packed and shipped to the State college, where they are tested and scored by dairy specialists.

On butter, the following tests are made: Standard plant counts, yeast and mold counts, organoleptic scoring tests, 7-day keeping tests, butterfat, and moisture analysis. Tests on ice cream are standard plate counts, coliform counts, organoleptic scoring, butterfat, total solids, and weight analysis. On ice cream mix, tests made are standard plate counts and coliform counts. On cottage cheese, the tests are standard plate counts, coliform counts, and organoleptic scoring. Reports on the results immediately are mailed back to the plant. Every 6 months, cumulative reports, showing the results for that period, are sent to each plant. Letters are sent and personal calls are made to many of the plants, particularly those that have unsatisfactory answers. At least twice a year area meetings are held, and samples of products picked up from that area are scored and discussed with the plant operators and personnel.

Since this improvement program was begun in January 1955, the average score of over 75 percent of the butter, ice cream, and cottage cheese has increased 1 point-butter mostly from 89 to 90, ice cream from $90\frac{1}{2}$ to $91\frac{1}{2}$, and cottage cheese from $90\frac{1}{2}$ to $91\frac{1}{2}$. In the case of butter, on the basis of the Seattle market, this improvement would amount to increased income of about \$160,000.

The success of this type of program depends on getting the support of the industry in order that it will work with you and have confidence in the reports. Once this interest is aroused, everything possible should be done to retain the confidence of industry people. For instance, reports should be sent promptly, samples of fresh products should be picked up, plant scores should be kept confidential, and assistance should be given to plants in improving the quality of their products.

To give recognition for quality products, radio and newspaper publicity are given to deserving plants through contests at the State fair and various district fairs. Determination of the winners in these contests is based on the results of the quality improvement program, and represents the average score of the samples that are picked up during a period of from 1 to 12 months. However, no publicity is given to poor-quality products.

In conclusion, the dairy industry in Montana is very pleased with this program and hopes it can be continued. I personally believe that, although the beneficial results were not too encouraging during the first 6 months, they have been most encouraging since that time.

THE SHELF LIFE OF GRADE A MILK

Harvey J. Weavers
Wisconsin Department of Agriculture

A project on the shelf life of Grade A milk was started in October 1955. Its purpose was to evaluate what effect the temperature of the refrigerated cabinets and the condition of the original samples had on keeping quality of the Grade A milk. It was decided that the keeping quality would be determined by the standard plate count, coliform count, psychrophilic count, and the flavor of the milk. The study was to be run at three intervals during the year to take into consideration seasonal changes.

Two local dairies were contacted and they offered to provide half-pint paper cartons for this study. Paper cartons were selected because they represented the majority of milk sales from retail outlets.

Four local merchants permitted the use of a section of their refrigerated cabinets. Two of these cabinets were entirely enclosed with sliding doors. The other two were of the open-top variety usually found in supermarkets.

Refrigerator cabinet No. 1 was entirely enclosed, with a glass front and sliding doors in the rear. The milk samples were located in the front lower corner of the cabinet. This cabinet was located in a retail dairy product store.

Refrigerator cabinet No. 2 was also entirely enclosed, but had sliding glass doors in the front. The milk samples were located in the back left corner of the third shelf. This cabinet was located in a retail dairy products store.

Refrigerator cabinet No. 3 was of the open-top variety commonly found in supermarkets. The samples were located near the rear of the cabinet. This cabinet was located in a local chain store.

Refrigerator cabinet No. 4 also was of the open-top variety. The samples were located in the rear of the cabinet. This cabinet was located in a local chain store.

The first morning, 27 successive half-pint cartons were obtained from each dairy. These samples were immediately iced and taken to the cabinets in the 4 stores. Six samples from each dairy and 1 extra milk carton with a thermometer sealed into it were placed in each of the 4 cabinets. (One sample from each dairy was taken to the laboratory for plating.) Each morning 2 half-pint cartons (one representing each dairy) were picked up from each of the refrigerated cabinets, and the temperatures of the milk and cabinets taken and recorded. These half-pint cartons were packed directly in ice and were taken to the laboratory for standard plate counts, coliform counts, and psychrophilic counts according to "Standard Methods for the Examination of Dairy Products." Each afternoon, the temperatures of the cabinets and milk

again were taken and recorded. At the end of the 10-day period, the milk was graded for flavor.

Part 1 -- Date: October 17-23, 1955

Weather: High 76°F. Low 50°F.

The laboratory tests on the original samples (one from each dairy) revealed that the milk from both dairies had negative coliform and less than 300 psychrophilic counts. Although both samples had a low standard plate count, sample "A" was slightly lower than sample "O". The results are shown in table 1.

Table 1

| | <u>Standard Plate Count</u> | <u>Coliform Count</u> | <u>Psychrophilic Count</u> |
|---------|-------------------------------------|---------------------------|--------------------------------|
| Dairy A | 600 | 0 | ∟ 300 |
| Dairy O | 1,700 | 8 | ∟ 300 |

The samples from all refrigerated cabinets at the end of the 10-day period had a high acid flavor. The samples from cabinet 1 had a very pronounced acid flavor.

Refrigerated cabinet No. 1

Cabinet temperature range 44° - 50°F.
Milk temperature range 44° - 49°F.

Table 2 shows that the standard plate counts of dairy "O" exceeded the 30,000 limit between the third and fourth days, whereas dairy "A" exceeded the limit between the fourth and seventh days. The psychrophiles showed practically the same picture as the standard plate count. The coliforms varied somewhat in that as early as the first day the milk from dairy "O" exceeded the limit of 10 coliforms, but after the second day increased very rapidly. Dairy "A" on the other hand, had two samples on the fourth and seventh days that exceeded the limit, but on the tenth day returned to no coliforms.

Refrigerated cabinet No. 2

Cabinet temperature range 39° - 44°F.
Milk temperature range 40° - 42°F.

Table 2

Refrigerated cabinet No. 1

| Time | Temperature | | Dairy "A" | | Dairy "O" | |
|-----------------|-------------|--------------|----------------------|----------------|----------------------|----------------|
| | No. days | Milk Cabinet | Standard Plate Count | Coliform Count | Standard Plate Count | Coliform Count |
| Original sample | | | | | | |
| 10-17-55 | 0 | PM-46° | 600 | 0 | 1,700 | 8 |
| | | | | | | 300 |
| 10-17-55 | 0 | PM-47° | | | | |
| 10-18-55 | 1 | AM-48° | | | | |
| | | AM-50° | | | | |
| 10-18-55 | 1 | PM-44° | 1,200 | 0 | 1,900 | 22 |
| | | PM-44° | | | | 300 |
| 10-19-55 | 2 | AM-44° | | | | |
| | | AM-46° | | | | |
| 10-19-55 | 2 | PM-44° | 1,300 | 0 | 1,600 | 3 |
| | | PM-48° | | | | 300 |
| 10-20-55 | 3 | AM-46° | | | | |
| | | AM-48° | | | | |
| 10-20-55 | 3 | PM-46° | 1,300 | 0 | 2,200 | 57 |
| | | PM-46° | | | | 2,900 |
| 10-21-55 | 4 | AM-44° | | | | |
| | | AM-46° | | | | |
| 10-21-55 | 4 | PM-46° | 15,000 | 20 | 72,300,000 | 71,000 |
| | | PM-46° | | | | 72,000,000 |
| 10-24-55 | 7 | AM-46° | | | | |
| | | AM-49° | | | | |
| 10-24-55 | 7 | PM-49° | 280,000 | 13 | 710,000,000 | 71,000 |
| | | PM-49° | | | | 710,000,000 |
| 10-27-55 | 10 | AM-48° | | | | |
| | | AM-46° | | | | |
| 10-27-55 | 10 | | 710,000,000 | 0 | 710,000,000 | 71,000 |
| | | | | | | 710,000,000 |

Table 3 shows that the standard plate counts and the psychrophilic counts of dairy "A" were satisfactory after the seventh day--the 10-day sample was lost during the study. The milk from dairy "O" exceeded the limit between the fourth and seventh days. As to coliforms, dairy "A" showed no coliforms present, whereas dairy "O" had some present every day, with an excessive amount between the fourth and seventh days.

Refrigerated cabinet No. 3

| | | | |
|---------------------------|-----|---|-------|
| Cabinet temperature range | 40° | - | 48°F. |
| Milk temperature range | 39° | - | 41°F. |

Table 3

Refrigerated cabinet No. 2

| Time | Temperature | | Dairy "A" | | | Dairy "O" | | | | |
|---------------------------|-------------|----------|-----------|---------|----------------------|----------------|---------------------|----------------------|----------------|---------------------|
| | Date | No. days | Milk | Cabinet | Standard Plate Count | Coliform Count | Psychrophilic Count | Standard Plate Count | Coliform Count | Psychrophilic Count |
| 10-17-55--Original sample | | | | | | | | | | |
| 10-17-55 | 0 | PM-40° | PM-40° | PM-40° | 600 | 0 | < 300 | 1,700 | 8 | < 300 |
| 10-18-55 | 1 | AM-40° | AM-39° | | | | | | | |
| | | PM-42° | PM-40° | 1,000 | 0 | < 300 | 800 | 4 | < 300 | |
| 10-19-55 | 2 | AM-42° | AM-42° | | | | | | | |
| | | PM-40° | PM-42° | 1,100 | 0 | < 300 | 1,000 | 5 | < 300 | |
| 10-20-55 | 3 | AM-42° | AM-44° | | | | | | | |
| | | PM-40° | PM-40° | 800 | 0 | < 300 | 1,100 | 2 | < 300 | |
| 10-21-55 | 4 | AM-40° | AM-40° | | | | | | | |
| | | PM-40° | PM-40° | 900 | 0 | < 300 | 1,300 | 3 | 1,400 | |
| 10-24-55 | 7 | AM-40° | AM-40° | | | | | | | |
| | | PM-40° | PM-42° | 1,100 | 0 | 1,500 | 600,000 | 81 | 71,000,000 | |
| 10-27-55 | 10 | AM-42° | AM-42° | -- | -- | -- | -- | 75,000,000 | 71,000 | 710,000,000 |

Table 4 shows that the standard plate counts, psychrophilic counts, and coliform counts of the milk from dairy "A" were satisfactory after the tenth day except that the psychrophilic count exceeded the 30,000 limit on the tenth day. The milk from dairy "O" satisfactorily met the requirements for Grade A milk until between the fourth and seventh days.

Refrigerated cabinet No. 4

| | |
|---------------------------|-------------|
| Cabinet temperature range | 34° - 43°F. |
| Milk temperature range | 37° - 40°F. |

The study was repeated March 15 and June 4, 1956.

Table 4

Refrigerated cabinet No. 3

| Time | Temperature | | Dairy "A" | | | Dairy "O" | | | | |
|---------------------------|-------------|------------------|------------------|---------|----------------------|----------------|---------------------|----------------------|----------------|---------------------|
| | Date | No. days | Milk | Cabinet | Standard Plate Count | Coliform Count | Psychrophilic Count | Standard Plate Count | Coliform Count | Psychrophilic Count |
| 10-17-55--Original sample | | | | | | | | | | |
| 10-17-55 | 0 | PM-44° | PM-44° | PM-44° | 600 | 0 | ✓ 300 | 1,700 | 8 | ✓ 300 |
| 10-18-55 | 1 | AM-39° PM-40° | AM-41° PM-46° | | 1,400 | 0 | ✓ 300 | 1,000 | 10 | ✓ 300 |
| 10-19-55 | 2 | AM-39° PM-40° | AM-41° PM-45° | | 1,100 | 0 | ✓ 300 | 1,000 | 1 | ✓ 300 |
| 10-20-55 | 3 | AM-40° PM-40° | AM-43° PM-48° | | 800 | 0 | ✓ 300 | 900 | 1 | ✓ 300 |
| 10-21-55 | 4 | AM-40° PM-40° | AM-43° PM-46° | | 1,000 | 0 | ✓ 300 | 1,200 | 4 | 430 |
| 10-24-55 | 7 | AM-39° PM-40° | AM-43° PM-44° | | 1,100 | 0 | 3,200 | 510,000 | 120 | 71,400,000 |
| 10-27-55 | 10 | AM-40° | AM-43° | | 3,500 | 0 | 710,000,000 | 75,000,000 | 150 | 710,000,000 |

A check of various business establishments in the city of Reedsburg, Wis., on refrigeration temperatures of Grade A dairy product cabinets was made June 13, 1956. The results were as follows:

| | | |
|------------------------------------|----------------------------------|-------|
| Store A - supermarket | Dairy cabinet | 46°F. |
| Store B - supermarket | " " | 40°F. |
| Store C - grocery | Dairy cabinet under meat counter | 46°F. |
| Store D - dairy bar | Dairy cabinet | 42°F. |
| Store E - restaurant | Dispenser | 40°F. |
| | Refrigerator in kitchen | 46°F. |
| Store F - restaurant | Fountain cabinet | 52°F. |
| Store G - market | Dairy cabinet | 49°F. |
| Store H - market | " " | 48°F. |
| Store I - chainstore | " " | 46°F. |
| Store J - market | " " | 45°F. |
| Store K - market | " " | 43°F. |
| Store L - grocery market | " " | 55°F. |
| Store M - chainstore | " " | 45°F. |
| Store N - lunchroom | Refrigerator | 42°F. |
| Store O - root beer stand | Dairy cabinet | 49°F. |
| | Walk-in cooler | 34°F. |
| Store P - ice cream stand | Open refrigerated cabinet | 50°F. |
| Store Q - grocery | Dairy cabinet under meat counter | 35°F. |
| Store R - grocery | Dairy cabinet | 38°F. |
| Location S - foundry | Vending machine | 55°F. |
| Location T - commercial company | " " | 41°F. |
| Store U - hotel | Refrigerator | 50°F. |
| | Fountain cabinet | 42°F. |
| Store V - grill | Refrigerator | 53°F. |
| | Refrigerator | 50°F. |
| | Dairy cabinet | 60°F. |
| Store W - hotel | Dispenser | 42°F. |
| | Dairy cabinet | 41°F. |
| | Walk-in refrigerator | 36°F. |

Exactly 50 percent of the refrigerated dairy product storage areas were above 45°F.

It is evident from this project that the original quality of the bottled milk and the ambient temperature of the refrigerated cabinet determine the shelf life of Grade A milk. The following conclusions, therefore, can be drawn:

1. It is important that fluid milk plants maintain a very high-quality milk supply not only with regard to its low bacteria count, but also with regard to its type of bacterial flora.
2. Active organisms will increase significantly in direct relation to ambient temperature surrounding them. Consequently it is important that the refrigerated cabinets in retail milk outlet stores be maintained to provide temperatures between 36°F. to 45°F., but not to exceed 45°F. In this project, the refrigerated cabinets that reached temperatures above 45°F. resulted in a reduction in the shelf life of the milk.
3. The results of this project indicate that the season of the year did not have a direct influence on the keeping quality of the milk.
4. Coliforms, when present in the milk, grow rapidly even when the milk is held to 40 to 45°F.
5. Although the psychrophiles apparently are responsible for certain off-flavors and for decreasing the shelf life of milk, this study was not extensive enough to come to any definite conclusions. It does appear, however, that when psychrophiles do start growth, they increase very rapidly and seem to parallel the increase of those bacteria growing at the higher temperatures and many times exceeding their rate of growth in the last days of the project. Since many of the organisms growing at 5°C are probably facultative rather than obligate organisms they also will be found on plates incubated at higher temperatures.
6. In most cases, the temperature in the open-top refrigerated cabinets varied more radically than in the enclosed cabinets.
7. The milk from each refrigerated cabinet tended to develop off-flavors between the fourth and tenth days. The milk from the higher-temperature cabinet developed the off-flavor more quickly and with more intensity than the other three.

Recommendations that may be made as a result of this study are:

1. All Grade A dairies should continue to improve their incoming milk supplies to provide the best quality milk for sale to their consumer customers.
2. Cartons in which milk is to be sold at retail outlets should be stamped with the date that the milk is processed and the cartons rotated so that the oldest are in a position to be sold first.
3. Dairies providing milk to retail outlets should not permit milk to remain in these stores more than 4 days.
4. Dairies should check all their retailers' refrigerated cabinets to make sure that the temperature in them does not exceed 45°F.

This project was aimed at improving the handling of Grade A bottled milk. To insure, a desirable, fresh, wholesome product, to the distributor should provide milk of high quality, and this product should be held at a temperature below 45°F. and no longer than 4 days. These measures will result in an increase in the consumption of milk, and the producer, processor, retailer, and consumer of Grade A milk thereby will benefit from the program.

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING MILK AND DAIRY PRODUCTS BY
IMPROVING FACILITIES FOR PROCESSING AND DISTRIBUTION

A motion was made and carried that the report of the work group handling this subject be tabled on the grounds that the conclusions and recommendations presented in it did not apply to the Nation as a whole.

POULTRY AND EGGS
(Work Group Sessions)

REDUCING COSTS OF MARKETING EGGS BY
MAINTAINING QUALITY

James R. Harris
Illinois Department of Agriculture

The quality maintenance problem in marketing eggs is a big one in Illinois and the Midwest. The Midwest, including Illinois and 12 nearby States, produces more than half the eggs in the Nation. Illinois is unique among surrounding States in that it is listed as a deficit egg-producing State. This picture gives at first glance the wrong impression about what the problems might be. The truth of the matter is that even though more eggs are consumed in Illinois than are produced, many Illinois eggs must find out-of-State markets, while eggs of higher quality, or at least of a higher

reputation, are imported. Aggravating this situation and helping retain its status is the fact that egg production is still pretty much a sideline operation in Illinois.

Too high a percentage of these eggs are in the make-up of the total production picture. Three-fourths of the eggs produced in 13 Midwestern States, where production exceeds local needs by 40 percent, come from flocks of 100 to 300 in size.

Now let us look at what are considered key quality problems in Illinois:

1. Egg quality is too low at the point of first sale by the producer, indicating an inadequate quality control program at the farm.
2. Too many eggs are still marketed by the producer on a one-price basis with no advantage given for better quality.
3. Too much quality loss occurs between the first buyer and the central plant.
4. Lack of refrigeration and of general egg care at all levels of egg handling is still a problem.
5. Improper use or lack of understanding of grade standards is a great handicap.

All these and other problems we might list could well be wrapped up into one, "How can we get Illinois eggs to consumers' tables in top quality condition?"

Early in 1950, the Illinois Poultry Industry Council set up three specific projects designed to improve quality by:

1. Establishing uniform standards and requiring their use in labeling eggs at retail.
2. Instituting, if possible, a price reporting service reflecting prices by consumer grades.
3. Working to increase the extension staff at the University of Illinois in poultry production and marketing.

The poultry industry was successful in getting the present Illinois Egg Law through the legislature in 1951. During 1952 and 1953, many informational meetings and demonstrations were held to acquaint those concerned with the requirements and the importance of the new law. At the same time, reporting of farm paying prices by areas on a graded basis was begun to fulfill another goal of the industry. During the years since 1952, Illinois has undertaken or cooperated in numerous projects to help maintain egg quality from the producer level to the consumer.

In July 1955, a further effort was made to provide for a State-supported enforcement program. Six full-time egg inspectors were arranged for to operate from the division of markets. Inspector training programs were set up, and followed with periodic refresher training sessions.

Early concentration on enforcement work showed clearly a need for more information on the egg law and egg quality in general at the producer, dealer, and consumer levels. At special meetings of the Poultry Industry Council with the department of agriculture, the extension service press and radio, and others, the best method of approach to use was planned not only to assist with the egg law but also to help get eggs of higher quality to consumers. Agencies assigned responsibility for preparing public information on the law were the State department of agriculture, the University of Illinois, Southern Illinois University, chain and independent retail organizations, the Illinois Agricultural Association, and the Illinois Poultry Industry Council.

The articles prepared were varied in their content. Some were beamed at the trades people, emphasizing their responsibility under the law and the advantages they could expect from its active enforcement. Others were geared primarily to egg producers, while still others were written to give consumers an interest in and understanding of the law. Excellent cooperation was received from all agencies, and the State was well saturated with many good stories and articles.

In addition, public meetings were held on a State-wide basis. By June 1956, 71 meetings were held in 66 counties. Since not all of the State has been covered, the meetings are being continued.

Another approach has been the use of displays and demonstrations on egg quality and quality maintenance wherever an opportunity and staff were available. For example, quality demonstrations have been conducted before high-school groups where audiences averaged 100 per demonstration; a refrigerated display of eggs with a quality maintenance theme was set up in Peoria for the annual convention of the Illinois Retail Grocers Association; and an exhibit was prepared for the State fair.

An immediate outgrowth of a stepped-up enforcement and educational program has been the setting up of a new cooperative truck-route buying program by the Illinois Farm Supply Company, an affiliate of the Illinois Agricultural Association, and a graded-egg buying program by a large grocery chain in southern Illinois. The new truck procurement program has extended a grade-buying market to several counties where previously no graded market existed for producers, and has supplied the grocery chain with a reliable source of graded eggs.

The present overall picture, compared with that of 7 years ago in regard to number of eggs marketed on a quality basis, the opportunity for the producers to sell on a graded basis, the increase of refrigeration at all levels, the increased volume of graded eggs moving at retail, the increase in size of production units along with adjustment to move uniform production in line with market needs, is indeed gratifying.

REDUCING COSTS OF MARKETING POULTRY AND EGGS
BY MAINTAINING QUALITY

Pyron Keener
Alabama Department of Agriculture

Marketing problems are brought about when you have something to sell. Until recent years Alabama had very little trouble in marketing poultry and eggs, simply because few poultry products were produced on a commercial scale. No other segment of agriculture in Alabama has ever expanded as rapidly as the poultry industry. In 1955, the percentage of production as compared to consumption of poultry products was:

| | <u>Percent</u> |
|--------------------|----------------|
| Eggs | 61 |
| Broilers | 284 |
| Fowl | 75 |

The importation of eggs into Alabama is gradually decreasing due to increased production. This trend may be attributed to the enactment of the shell egg law in April 1955, which requires that all eggs sold in the retail market be accurately labeled and graded as to both quality and size. It is believed that marketing costs can be reduced by maintaining quality, which, in turn, can be brought about by enforcement of the egg law. Through the egg law, Alabama will:

1. Encourage local egg production. Certainly quality can be better maintained with locally produced eggs, and breakage can be reduced because the distance from producer to market is much shorter.
2. Encourage an increase in sales volume. Since the quality of commercially produced local eggs is generally better than that of eggs shipped long distances, sales are larger, thereby leading to a reduction in per-unit marketing cost.
3. Encourage quality merchandise. When the market is really competitive, it pays to have quality merchandise. This means less time spent in marketing the product.

4. Encourage use of a wider range of markets. Bigger and better markets can be reached with top-quality poultry and eggs. The large, modern supermarket wants a constant supply of good merchandise at all times.
5. Discourage inferior grades of poultry and eggs difficult to sell. The market in the State for low-grade poultry and eggs is relatively small. However, C grade eggs and poultry are being sold in some cities where low-grade products are in demand.

Poultry and egg processors have trouble moving low-quality merchandise. Alabama has no egg-breaking plants. The nearest plant of this kind is located in southern Tennessee. Low-grade poultry is usually sold as cut-up poultry at bargain prices. Therefore, the costs of marketing good-quality poultry and eggs are actually less than those of low-quality products.

Enforcement of the egg law has already brought about significant marketing improvements. The old way of marketing eggs in Alabama is rapidly disappearing. The days of the "bucket boy" (selling eggs in small quantities to retail stores) is fast coming to a close. Either you are in the poultry business, or you are out of it.

Several feed dealers are acting as egg "pickup" stations and doing a good job of marketing eggs for poultrymen. Poultry producers associations are helping poultrymen in marketing problems. These cooperatives usually sell feed, which they deliver to the farms weekly, and pick up the eggs every other day. The eggs are brought into the station, where they are graded, packed, and distributed. Quality is maintained and marketing costs are reduced by holding down handling and transportation to a minimum.

Many commercial egg-producing flocks of 5 to 10 thousand birds can be seen in Alabama. Chickens in cages number more than one-half million. An egg dealer in Alabama supplying eggs to one of the largest retail store chains was having trouble with the eggs that he obtained from out of the State. Therefore, he entered into the egg producing business. He now maintains the quality of eggs needed by the retail store chain, and at the same time had greatly cut down his marketing cost by reducing or eliminating rehandling costs.

CONCLUSIONS AND RECOMMENDATIONS ON REDUCING COSTS OF MARKETING POULTRY AND EGGS BY MAINTAINING QUALITY

The work group, representing 15 States, discussed at some length egg and poultry laws in effect in each State represented. From this discussion the following was concluded as to the far-reaching effect such laws could have in reducing costs of marketing poultry and eggs by maintaining quality.

A sound regulation or law takes into consideration the need for thorough producer, processor, and consumer education on provisions which include compulsory grading at the consumer level in accordance with USDA standards of quality and grades, uniform labeling as to weight and quality at all trading levels, minimum requirements as to refrigeration, penalties for violation, and fees that provide for adequate operation and administration. These provisions must all have been developed in carefully planned industry-wide meetings, and must have received reasonable acceptance. Effective administration includes care in selecting and training a corps of workers to help producers, packers, processors, and retailers understand and comply with the requirements of the law.

It was generally felt that by the services rendered in this direction a great step forward could result in the effort to maintain quality through the spur of economic gain each segment of the marketing team would experience.

The recommendations of the group to improve the chances of the greatest gain in this direction are:

1. A meeting of marketing officials in the future to discuss and to develop a set of uniform fundamentals necessary for sound poultry and egg laws. These fundamentals should be available to industry, legislative groups, and educational agencies, to the end that wide differences in requirements and interpretations be reduced and simplicity increased.
2. Development of educational material and programs in connection with existing or considered egg and poultry legislation, and a plan for its most complete dissemination at producer, processor, and consumer levels.
3. Exploring the possibilities of producer-direct-to-retailer marketing in independent commercial egg production.
4. Exploring the degree of responsibility that the retailer is to bear for the maintenance of quality.

REDUCING COSTS OF MARKETING POULTRY AND EGGS BY
IMPROVING HANDLING METHODS AND EQUIPMENT

John A. Hamann
Transportation and Facilities Branch
Agricultural Marketing Service, USDA

Successful research efforts in the efficient production of poultry products are reflected in the favorable feed-egg and feed-poultry-meat ratios. Improvements developed through research in better flock management may be seen in the ever increasing number of successful, large commercial broiler and turkey flocks for poultry meats and in the increase in large commercial egg production flocks, particularly the cage laying operation.

Some significant research work has been done in the grading and processing operations in the quality evaluation field, such as mechanical blood-spot and green-rot detection and sorting eggs as to shell color in the egg grading operation, and effects of scald temperatures and immediate freeze after kill on poultry meat tenderness. However, little has been published on improved handling methods and equipment for poultry and poultry products processing and packing for market. The field is wide open and offers many opportunities for significant savings through research.

The U.S. Department of Agriculture has teamed up industrial engineers and agricultural economists to tackle the job. Some progress has already been made in this field in developing improved handling methods and equipment for the packing operations in both poultry and egg packing plants. Popular articles have been published on improved equipment developed to pack ice-chilled poultry and cartoned eggs more efficiently. Presently work is under way to develop an experimental egg grading line that will integrate the recently developed electronic blood-spot detector into a commercial egg-grading line. Tests will be conducted to determine equipment modification, added costs, and savings in labor that can be expected. The results will be analyzed to determine the economic impact on the industry and an interim report will be published.

Other work under way includes analysis of popular egg-grading systems currently in use throughout the United States, to determine the most desirable combinations of equipment for different sizes of operations, and analysis of the poultry packing operation in large processing plants. Reports will be prepared and published as results are analyzed.

In order to get the widest possible industry acceptance of this work, it is important that the results be applied with a thorough understanding of the problems involved and remedies that are applied. Valuable assistance can be provided in this direction by State workers at field level through their industry contacts if they have acquired a thorough knowledge of the problems of the processing plant and an understanding of the basic principles we are applying.

REDUCING COSTS OF MARKETING POULTRY AND EGGS BY IMPROVING HANDLING METHODS AND EQUIPMENT

R. J. Park
Tennessee Department of Agriculture

The marketing of poultry and eggs is not new. However, our problems of marketing these products today are somewhat different from what they were a number of years ago, when practically all eggs were sold loose and chickens were killed and dressed in the market where the housewife could see the operation performed.

Today, the consumer wants practically all the items prepackaged, with eye appeal and with the contents visible. These demands by the consumer have brought about vast changes in the processing, packaging, and handling of poultry and poultry products.

A majority of the poultry processing plants need to make many improvements if they are to operate more economically, and practically all need to improve plant sanitation. Major changes in poultry processing plants are expensive. They must be made with caution in view of the fact that compulsory inspection of poultry for wholesomeness is just around the corner.

Our role in poultry processing must be one of working with the plant operators to assist in minimizing overhead costs wherever possible. In many instances, it may mean only rearranging and repairing present equipment to facilitate more economical and sanitary operation.

Prepackaging of poultry is on the increase in many plants. This added service increases rather than decreases the cost of marketing. Modern equipment for processing and packaging poultry parts is needed to lower this cost.

The selling price of frozen poultry parts seems to be out of line with the price of fresh processed poultry. Consumer acceptability of frozen poultry products is low because of their relatively high prices. More consideration should be given to this aspect of poultry marketing.

Egg marketing is an important phase of the poultry industry. In fact, it is one of the most, if not the most, important part of a successful poultry industry; however, it often appears to be the most neglected. The marketing of eggs begins with shipment from the farm and continues until the eggs are received by the consumer. Refrigeration is important if eggs are to retain their quality; however, handling and packaging are equally important steps in the marketing operation and deserve a prominent place in the marketing research picture.

In placing emphasis on the refrigeration of eggs at the producer level, the development of convenient, more economic refrigeration should be considered so as to bring about a reduction in the number of producers who neglect this important factor.

The egg packing operation cannot be eliminated; however, in packing plants much can be done to reduce this cost. Overcrowded conditions and inconvenience of plant layout in general can add to the cost of handling and packing eggs.

Proper planning of egg packing plants and poultry processing plants adds greatly to the economy of operation and to the quality of the product.

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING POULTRY AND EGGS BY
IMPROVING HANDLING METHODS AND EQUIPMENT

A total of 29 people, representing 21 States, participated in this work group. The talks presented at the opening of the meeting raised the question of providing handling method and equipment improvement services to producers and processors. It was generally concluded that this type of service was in great demand, but that the service provided frequently was performed on a "we do it as best as we know" basis. Limited assistance has been rendered in this direction by equipment manufacturers in instances where major installations are involved. The question was raised, however, as to the value of such help in the absence of information on competing equipment, best layout combinations for operations of specific volume, and essential equipment needs in relation to national industry practice and research findings.

It was concluded that a step toward improvement of this service would be the development of an intimate knowledge of handling and equipment problems by close association with, and careful study of, processing and handling operations. Specific problems that could not be handled through common knowledge developed in this manner should then be referred to the U. S. Department of Agriculture for field assistance. The increasing need for this type of service is reflected in the rapid increase in the size and number of commercial chicken meat and egg processing, grading, and packing plants; in the many new packaging ideas; and in the additional processing steps that are rapidly becoming a part of preparing poultry and eggs for market.

Discussion again developed around the serious problems arising from lack of uniformity in legislation governing the marketing of poultry and eggs, in this case as it related to processing method requirements. It was concluded that group meetings of interested agencies, exchanging problems and ideas on proposed legislation, could keep serious inequities from occurring in enacted legislation.

The work group developed the following recommendations:

1. Group meetings representative of interested agencies should be held for the purpose of exchanging ideas on proposed legislation to the end that uniform and fair processing requirements can be developed.
2. An adequate USDA field service is needed to provide assistance in improving existing poultry and egg processing and packing operations and in planning new installations.
3. An appraisal should be made of the application of the suggested sanitation and operating requirements when shelf-life-extending antibiotics recently introduced into the poultry processing operation are used.

4. Facility operations and equipment, labor, and production requirements should be studied for the purpose of developing economic producer-direct-to-retailer marketing of eggs.
5. Facility operations, equipment, and labor requirements in precooking poultry also should be studied, and new packaging trends in the marketing of poultry and eggs should be appraised.

REDUCING COSTS OF MARKETING POULTRY AND EGGS
BY MODERNIZING DISTRIBUTION FACILITIES

Ralph B. Kelly
North Carolina Department of Agriculture

The poultry industry, especially the production, processing, and distribution of broilers, has made a phenomenal growth over the past 20 years. During 1934 the United States produced 34,030,000 commercial broilers, while in 1955 the production was 1,078,264,000. Not only has the broiler production had such a tremendous growth, but also the production of turkeys and eggs.

Twenty years ago most of the poultry processing and distribution methods were very crude; however, with the increased production of broilers, it was necessary to change the methods and techniques of assembling, processing, and distributing this product. Much progress has been made. The small hole-in-the-wall type of operation has been replaced by a modern system of handling a food product that is being well received by consumers. Many of you remember when the housewife would select a bird from a coop of live chickens at her grocer's. He would chop off the chicken's head, scald the chicken, and partially pick it. The housewife would complete the job of getting the chicken ready for the pan in her home. Yes, the same picture and process existed in restaurants and eating establishments. Picture, if you will for a minute, the inefficiency of the practice, the labor it took per chicken; the unused byproducts; and, most of all, the lack of creating a desire to serve or eat chicken often.

Now, the labor involved in processing a bird is measured in seconds instead of in minutes. Byproducts are being used efficiently, and new and better uses for them are being found all the time. The cost of distributing birds is a fraction of what it formerly was.

The development of the mechanical picker is a milestone in the industry, but it is realized today how antiquated that first picker was. With the coming of the drum picker, many small processing plants sprang up, most of them very efficient for their day. The advent of the assembly line process soon made the hand operation out of date. Modifications of, and additions to, this method have brought about the efficiency level that is known today. Of course, "backyard" operations still exist and will continue to do so for some time to come. Many of them, however, have succumbed to the larger, more efficient processors. More and more of the operations are being performed mechanically instead of by hand.

A brief glance at the industry shows a rapidly changing picture. Is it unreasonable to prophesy, then, that some day all of the operations necessary to get the bird from the coop to the table will be completely automatic? Persons in service work can see their future cut out for them. It is their responsibility to take an active role in the advancement of the techniques of processing and marketing agricultural products. Indeed, it is a challenge.

We, in North Carolina, are very much aware of this challenge and we have attempted to meet it. We assist the industry in every possible way. In our department, we have a man whose duties are to work with the poultry processors in drawing up plans for new processing plants and for remodeling existing plants, and to assist with technical problems that arise in the industry.

Procedures vary in each case, but let us go through a typical procedure to show the various ways in which we may assist in the processing and marketing of poultry. Our services are provided strictly on a voluntary basis and are available to anyone who has a direct interest in the marketing of poultry. A request may come from any number of sources--processors, feed dealers, agricultural workers, bankers, industrial development representatives--for assistance in starting a processing plant or remodeling an existing plant. We then launch a thorough investigation to determine if a plant would be advisable in areas where there are none at the present time. We consider such things as the number of broilers and turkeys now grown in the area and the potential for increasing production, the probable effect on the marketing picture for the area, the potential market outlets, the financing that can be arranged, availability of labor and personnel, water supply, sewage and waste disposal, cost of power, taxes, building codes and zoning laws, and any other factor that could influence the operation of the plant. Of course, some of the leg work is done by the interested persons before we are contacted.

When it is determined that a processing plant is advisable, we draw a floor plan and formulate a list of specifications according to AMS PY-Instruction No. 915-1, "Information Required on Blue Prints and Accompanying Specifications for Poultry Plants." The principles followed in developing a plan are:

1. An orderly movement of materials through the plant. We like to have the live birds enter at one end, with the edible products leaving at the other end and the inedible products leaving at one side of the building.
2. Overall layout for a minimum of building costs without materially sacrificing efficiency.
3. Arrangement of equipment in as nearly a straight line as possible, avoiding long lengths of unused conveyor track.
4. Arrangement of equipment for maximum ease of cleaning and adjusting.

5. Use of the most efficient equipment that is available.
6. Separation of the operations that should be apart for maximum sanitation.
7. Type of construction and kinds of building materials that lend themselves to maximum sanitation.
8. Employee facilities for reasonable comfort of the workers and for maximum sanitation procedures.
9. Avoidance as much as possible of the showing of architectural details, particularly those that would vary from locality to locality.
10. Provision insofar as practical for future expansion with a minimum of tearing out and moving of the more expensive installations.
11. An insistence on strict adherence to the sanitary requirements as stated in Section 70.240 of the USDA Regulations Governing the Grading and Inspection of Poultry.
12. Avoidance of "cross-currents" of employees, products, or materials.
13. Use of conveyors, forklifts, dollies, and other materials-handling equipment to foster the most efficient handling of materials.

Usually, several sketches of proposed layouts are made, and conferences are held with interested parties to go over carefully the advantages and disadvantages of each layout, combining the good points and eliminating weaknesses of each, until a plan that seems to be the best for the particular situation is developed. Then, the preliminary plan is drawn to scale, including all the accessory rooms and compartments and showing enough detail to determine if the plan is workable. After several conferences, consultations, and revisions, a plan is evolved that embodies the best thinking and the latest technical advances that can be applied to the particular situation. The necessary details are added and blueprints are made.

But our work does not end there. Throughout the construction of the building, assistance is given whenever it is needed. The construction period provides an opportunity to learn of any short cuts that might be embodied into future work or any inefficiencies that might be avoided. Assistance also is provided in training workers to perform the operations in the most efficient and sanitary manner, and to help iron out any difficulties that may develop.

Assisting an existing plant to enlarge or to remodel is somewhat different from assisting a new one. When a request for assistance in remodeling or enlarging is received, the first task is to get complete information on existing facilities. In some cases, we have blueprints or complete measurements on file. In others, we must take complete measurements of the plant. We confer with the owner about his needs, making suggestions and helping him solidify his thinking on needed changes. We then proceed to develop a workable plan, following as much as possible the principles outlined earlier.

Another service offered on request is technical assistance. A processor might be having trouble with a drain that is not functioning properly, with inability to pick his chickens thoroughly enough by machine, with too many chickens being barked, with employees not being able to do the work as efficiently as they should, or with too much seepage in the plastic bag between the packing line and the freezer. Upon his request for assistance, we make on-the-spot investigations to determine the cause of the trouble. After the cause is determined, we find a solution and make recommendations.

Throughout all of this work with processors, one fundamental fact permeates our efforts. Sooner or later, Federal inspection of poultry will be compulsory unless some major force reverses the flow of the tide. We are now, and have been for some time, preparing our processors and ourselves for that time. Whenever possible, we are learning the interpretations that are being applied to the Federal standards by the USDA officials. We are preparing our plants by (1) encouraging that plans for new plants be approved by the Inspection Service before construction begins; (2) giving them the benefit of our experience with the Inspection Service wherever and whenever it is requested, almost to the point of giving our service without its being requested; and (3) keeping them completely up to date on any new development.

Our working relationship with the USDA Inspection Service is good, so that we have a good working knowledge of what they want and require insofar as plant arrangement, sanitary requirements, employee facilities, and building materials are concerned. Of course, we adhere strictly to the "Regulations Governing the Grading and Inspection of Poultry" in any new construction or in any remodeling plans.

REDUCING COSTS OF MARKETING POULTRY AND EGGS BY MODERNIZING DISTRIBUTION FACILITIES

Tom Fox
Oklahoma State Board of Agriculture

Although the topic which has been assigned to me is, "Reducing Costs of Marketing Poultry and Eggs by Modernizing Distribution Facilities," it is to be presumed that the subject is also intended to cover a discussion of more adequate procedures of distribution; therefore, my remarks will be submitted to you accordingly.

Most of you are aware, of course, that Oklahoma has no legislation directly applicable to reducing costs of marketing poultry and eggs by modernizing distribution facilities other than a statute which provides, in effect, that no agricultural commodities may be sold in the State under any descriptive terminology whatsoever that would falsely imply or suggest that such products have been officially graded by either the State or the Federal Government.

Seizing upon the advantages afforded by this legislation, we made available to the industry a voluntary mutual agreement contract. This contract authorizes any person or firm to market dressed poultry in this State on a graded basis, provided their dressing plant facilities are adequate and meet the sanitary requirements specified in the contract. Under the terms of the contract, plant facilities, sanitary requirements, and grade specifications shall coincide with those established by the U. S. Department of Agriculture. The dressing plants of all applicants for the service are carefully inspected, and the necessary changes for improvement outlined. These plants are again inspected, occasionally several times, before final approval. It should be made clear that this plant inspection service is all rendered free of charge. A list of all retail outlets for the dressed product is furnished to us, and the grade of the product is checked by our inspectors at the retail level. Our poultry marketing specialists worked with processing plants and the inspectors in order to improve facilities, distribution methods, and product quality.

Much of the Oklahoma-produced poultry is processed in adjoining States; therefore, during the past year, 18 plants in Oklahoma, Arkansas, Missouri, and Texas have been inspected. It is required that out-of-State dressing plants meet our specifications for plant facilities and sanitation whenever the product originating from the plants is to be marketed in Oklahoma on a graded basis. Mutual agreement contracts were signed with 10 of these 18 plants. In addition to visits by our inspectors, during the past year 4 of these plants were visited by our poultry marketing specialists only once, 4 were visited twice, 3 were visited 5 times, 2 of them 27 times, and 8 of them 19 times. It is necessary to visit the approved plants frequently to assist in ever-present marketing problems.

Approximately 700 Oklahoma retailers are selling poultry originating in these approved plants on a graded basis. Each bird is identified as to its respective grade by a grade label or wing tag. Our inspectors have made numerous periodic inspections of the poultry in these 700 stores. Each of these stores was awarded a certificate of quality. This certificate is furnished under the provisions of our marketing agreement. It is 8½ by 11 inches, is colorful, and bears the official seal of the State of Oklahoma. It is displayed adjacent to the graded poultry in the retail store, and tells the consumer that the product offered was processed in an approved plant, that the grade has been checked by State inspectors for their protection, and that the product is marketed under our marketing program. Each certificate is signed by the president of the State board of agriculture and by the director of the marketing division.

We are continually expanding our efforts to assist producers, processors, distributors, and retailers to facilitate and improve the marketing of dressed poultry, and our achievements have been rewarding in many respects. To enumerate a few: (1) A marked decrease in damaged birds; (2) better, more adequate, and more sanitary dressing plant facilities; (3) expanded outlets; (4) a greater demand for dressed poultry; and, (5) a quicker turn-over, all adding up to a more dependable and a better packaged product to the ultimate consumer.

In some instances, we found poultry processors attempting to grade the birds out of the chill tanks as they were being packed. In these plants, our marketing specialists pointed out to the processors involved the advantages of lengthening their line so that the poultry could be graded and most of it even sized on the line. It could then be separated into different chill tanks, in accordance with grade and size. This system, of course, eliminates double handling and the ultimate accomplishment is to reduce the costs of marketing the product. The above achievements were greatly aided through publicity programs conducted at the State's two largest fairs. The Oklahoma City fair had 20 feet of display space for graded poultry, including turkeys and graded eggs, and the Tulsa fair had 50 feet of display space for this purpose.

The volume of eggs marketed under the voluntary egg marketing program continues to increase. Due to the obvious advantages of marketing eggs on a graded basis, a great deal of sentiment has developed for a mandatory egg candling and grading law. Our market division has been largely responsible for fostering the State's poultry and egg steering committee, which is designed to aid in the very proposals indicated by my subject. This steering committee consists of members from the various segments of the poultry and egg industry, including producers, egg handlers, retail grocers, feed manufacturers, the marketing division of the State board of agriculture, the Oklahoma A & M College, and last, but not least, the general public.

To effectuate cost reductions in the marketing of eggs, we have, over a period of several years, held numerous schools with producers and egg handlers at country school houses, chamber of commerce offices and headquarters of county agents to explain the advantages to be gained by all of the various procedures for the proper handling of eggs, such as keeping the eggs clean, several daily gatherings from the nests, proper cooling facilities, marketing at least twice a week, as well as all of the other recommended handling practices. Our marketing specialists check the egg grades of those participating in the program at the retail level. Last year they worked with approximately 3,000 retail outlets on eggs marketed under the program. We issue a monthly report of the eggs inspected under the plan, which is sent to all segments of the industry participating in the program. This egg inspection report is steadily gaining in popularity and is used by many firms as a basis for trading.

Thirteen meetings were conducted last year in cooperation with county agricultural agents throughout the State. These meetings were for the purpose of formulating plans for the expansion of the program. To gain more publicity for better quality eggs, we worked in close harmony with home demonstration agents in 8 different cities and towns. Two marketing specialists have devoted approximately one-third of their time to assisting producers of both cage and floor-plan eggs in proper handling, grading, packaging, cooling and marketing of their product. This work also included obtaining the best distribution facilities and the most lucrative market outlets for their graded eggs. Training candlers and graders in commercial egg packing companies required about half as much time as the amount allotted producers. Several new cage egg projects have been developed during the past year, and the number of cage layers is now about 300,000. Last year, 53 egg-grading demonstration schools were held in 38 counties, with an attendance of approximately 3,800 producers, distributors, and consumers. Due to the established consumer acceptance of graded eggs in our State, most producers participating in the program now are realizing a premium of 8 to 12 cents per dozen for their product.

At this juncture, it is well to emphasize that many practices in marketing poultry and eggs in our area of the country are opposite to reducing costs of marketing from the standpoint of modernization of distribution facilities. The discrepancies to which I refer are, in all probability, identical to some problems with which most all of you are confronted. Time does not permit me to elaborate greatly on these hindrances, but it should be enough to apprise you of the fact that a great deal of poultry produced in Oklahoma is transported live, well within the borders of States adjoining Oklahoma. It is processed there, and the dressed product then is shipped back into Oklahoma for distribution. Needless to say, this same situation exists in reverse. Poultry produced in adjoining States is transported live into Oklahoma, processed there, and then re-shipped into other States for distribution.

Practically the same situation exists in regard to eggs. Oklahoma does not produce enough high-quality eggs to supply the demand; nevertheless, thousands of cases of high-quality eggs are exported annually. This very fact creates the necessity for the importation of thousands of cases of high-quality eggs to supply our local demand. It should be needless to point out the inconsistency with good marketing practices of this double transportation cost on these products, to say nothing of the loss incurred through the deterioration of egg quality, the inevitable shrinkage of poultry, and the almost certain hazard of scuffs and bruises on live poultry because of long hauls and tired, impatient, reckless handlers.

Our division and our Poultry and Egg Steering Committee have been constantly striving to solve these enigmas, but so far, the task of remedying the difficulty seems to have been utterly hopeless. I shall leave these thoughts with you for later consideration by this group.

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING POULTRY AND EGGS BY MODERNIZING
DISTRIBUTION FACILITIES

Representatives from 15 States discussed the modernization problems connected with present-day and possible future requirements in distribution facilities for poultry and eggs. Some time also was spent on problems presented by new facility requirements.

It was concluded that the increase in the number of large commercial egg producers marketing direct to retailers, and the change from country shipping point assemblers of irregular quality eggs in inadequate handling facilities, present a problem of modernizing facilities and introducing improved equipment in order to achieve the maximum benefits from improved grading, packaging, refrigeration, and handling equipment. Accompanying this problem is the need of training a new group of graders and handlers in the most efficient use of the facilities and a uniform application of grade standards, and the need for quality conservation practices such as humidity control and refrigeration.

In the poultry processing area, it was felt that a challenging problem presents itself in the need to furnish sound advice and guidance for the construction of new processing facilities for the ever-growing poultry meat industry, and to provide economically sound recommendations for modernization of existing facilities in light of possible mandatory inspection.

It was felt that North Carolina had developed and placed into action a most effective way to meet this challenge and that States confronted with the effects of expanding commercial poultry production could profit by studying its approach to the problem.

The work group developed the following recommendations with regard to ways by which State marketing service agencies can help to reduce the cost of marketing poultry and eggs by modernizing facilities:

1. To effect the widest possible use of modernized facilities and improved equipment needed in producing a uniform quality and attractively packaged table egg from relatively new, inexperienced packers, Statewide educational meetings should be encouraged to provide information on facility requirements, equipment use, and egg quality interpretation.
2. States plagued with outmoded poultry processing plants and needing new facilities for an expanding production should have available to them the plan used by North Carolina for handling this service problem.
3. Research data on the cost and performance ratings of the more popular types of poultry processing equipment should be made available to State marketing service personnel as soon as possible so that recommendations on equipment needs can be based on tested performance.

GRAIN AND SEED
(Work Group Sessions)

THE NORTH DAKOTA CLEAN GRAIN PROGRAM

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Mitchell, S. Dak. 9/

Although the clean grain program in North Dakota is a new field, much cooperative work has been done to prevent the contamination of grain. The rodent control branch of the North Dakota Department of Agriculture and Labor, the North Dakota Extension Service, and the U. S. Fish and Wildlife Service have worked hand in hand during the past several years developing educational programs, and have cooperated to stimulate research programs to find answers to the grain contamination problems. Even so, the clean grain program still can be considered in its infancy. There are many unknowns, and there are many answers to problems that can be found only by a trial-and-error method.

The Fish and Wildlife Service has been engaged in rodent control programs in North Dakota since 1915. The early programs dealt mainly with the control of mice in orchards, with prairie dogs on stock ranges, and with reduction of the population explosions of our squirrels in the 1930's. About 1943, this Service became actively engaged in the control of commensal rodents. In 1947, the North Dakota Department of Agriculture and Labor entered into a cooperative agreement with the Fish and Wildlife Service to work on rodent control. County-wide rodent control programs were organized. Because cooperation by the farmers was on a more or less voluntary basis, progress was slow.

Late in 1951, the Federal Food and Drug Administration announced that their inspectors would seize carlots of wheat which contained over two rodent droppings to the pint, or 2 percent insect damage, as well as carloads that contained treated seed wheat. This was a matter of immediate concern to the grain trade and to agricultural people all over the Nation. In January 1952, the North Dakota Extension Service called a meeting of the grain trade, railroads, farm organizations, and State and Federal agencies in any way involved with the handling, storage, or transportation of grain. A State clean grain committee was formed at this time, consisting of some 54 members representing these organizations and agencies. The committee set up goals, consisting of education promoting rodent control and research. It was felt that, through the cooperation of all the agencies involved, North Dakota could produce and market a more sanitary product.

9/ Formerly with the U. S. Fish and Wildlife Service at Bismarck, N. Dak.

Through the use of newspapers, trade journals, radio, and television, and through furnishing speakers for meetings, the educational program has been successful. There probably is not a farmer in North Dakota who has not heard of the clean grain program. The grain elevator operators have done a remarkable job of cleaning up their plants. In some instances, however, more clean-up work needs to be done.

The clean grain committee attempted to secure an appropriation for the department from the State legislature to promote the grain sanitation program. The requests were not granted because the members did not realize the seriousness of the situation facing North Dakota farmers and the grain marketing industry.

On July 1, 1955, the Agricultural Marketing Service approved a clean grain project, in the amount of \$9,000 to cooperate with the department of agriculture and labor in demonstrating methods of preventing deterioration and contamination of grain in storage. A similar project was approved on July 1, 1956, in the amount of \$14,000. These funds have permitted a considerable expansion of the action program.

Due to intensive control in some counties, the rat and mouse population is at a low level. Since January 5, 1955, only 1 of the 33 cars of North Dakota grain seized came from a county in which a grain sanitation program was conducted. It is conservatively estimated that each car seized represents a monetary loss of at least \$1,600.

On July 1, 1956, the Federal Food and Drug Administration reduced the contamination tolerance to one rodent dropping, or 1 percent insect damage to the pint. This new regulation is effective until June 30, 1957, at which time they may reduce the tolerance still further.

What is the North Dakota Department of Agriculture and Labor doing about the grain sanitation problem? As stated before, the department has a cooperative project with the Agricultural Marketing Service to conduct programs to prevent contamination. Through subsequent agreements with the North Dakota Extension Service, the project leader sets up countywide insect and rodent control programs in cooperation with the county agent, the county commissioners, township boards, or any association or organization interested in sponsoring a clean grain program. The county agent calls a general meeting of all people concerned, at which time the project leader outlines the grain sanitation problem. He discusses the baits to be used, and the method of financing the program is decided upon. Next, the county agent selects several farms conveniently located where demonstrations may be held, usually at least one demonstration for not more than four townships. The group then selects a week to hold the countywide program which will fit into the project leader's schedule, and the amount and type of bait required for the county is decided upon.

During the countywide clean grain week, the farm demonstrations usually are held in the morning. The project leader conducts the rodent control demonstrations, and the county agent, or his assistant, demonstrates the use of bin sprays for insect control. Trapping methods, as well as rat-proofing methods, are demonstrated, and farmers are shown the difference in baiting for rats and mice. They are told what results to expect from the poisons used and the importance of sanitation.

During the afternoon the crews move to the towns. They bait the grain elevators, city alleys, and dump grounds. This is an important phase of the program, for if rats and mice are not controlled in the cities, they soon will reinfest the farms and vice versa.

The greatest problem is to convince people of the importance of mouse control. Mice are the greatest contaminators of grain. Most people will tolerate a mouse, but these same people will go to great lengths to kill a rat. Rat control methods are simple compared to mouse control. It may be assumed that 20 to 30 percent of the female rats and mice in a colony are always pregnant, and in one year's time a single pair often produce 60 to 70 offspring that survive to maturity. With such a reproductive potential, a minor infestation will soon become a major one, and in a short time can contaminate a farmer's entire yearly production of food grain.

The need for a research program in this field was mentioned previously. Because funds for research were not available and could not be obtained, it was necessary to begin with a field demonstration program. However, knowledge is needed on where in the producing-handling chain most of the contamination occurs so that efforts may be concentrated there. It was not until October 1, 1956, that the North Dakota Experiment Station was granted funds to conduct research of this nature. They also will determine the species of mice present in fields and in storage facilities. This is important because no bait has been found acceptable for the control of all mice. The U. S. Fish and Wildlife Service is cooperating with them in this study. During this fall samples of grain were collected from combines at different locations in each field. Samples were taken from windrowed grain, from straight combining, from stack threshing, and from bundle threshing, as well as samples of the swath. Later, samples will be collected from farm grain bins, from trucks unloading at the elevators, and from the grain elevators when they are loading cars. All the samples will be examined at the college.

One advantage of an organized, supervised clean grain program is that new rodenticides and control measures may be studied and tested. During the past two years several anticoagulants have been tested.

To give you some idea of the activities of the project leader during the past two years, he has conducted 28 countywide programs, has contacted 3,421 people at meetings, and has made 2,006 individual farmer contacts. He assisted 192 elevator operators with individual problems. He appeared on 4 television and 5 radio programs. Approximately 89,000 pounds of bait were distributed and used by farmers during the clean grain programs.

How effective is this program? As yet there is no standard of measurement. It is known from the follow-up programs in the counties that the rat and mouse population is much less than it was in the first year of the program. As seizures increase, which they are bound to do, the response from farmers will get better. Each year more farmers are turning out for the demonstrations, and follow-up checks with individual farmers indicate that they are following recommendations and obtaining good results.

DETERIORATION OF SEED IN STORAGE

D. D. Hill

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In approaching the problem of deterioration of seed in storage, it is necessary to examine our concept of seed quality. Quality in seed differs from quality as we apply the term to other agricultural commodities. With the possible exception of malting barley, seed quality presents an entirely different concept.

Most agricultural commodities are used either directly or indirectly for food, feed, or fiber. In some instances, they supply the raw material for certain industrial products. Seed, however, has only one function--namely, to reproduce its kind and to do that quickly, vigorously, and accurately. In other words, unless seed is viable, unless it can grow, it has little or no value whatever. Seed quality, therefore, is made up of two basic factors. The first of these deals with its viability or ability to grow, the second with its composition. Composition is concerned primarily with trueness to type, mixtures, the amount of weed seeds either common or noxious, and the amount of inert material.

In considering seed deterioration, the matter of composition or purity is of little consequence. Unless changes are effected by the processor or handler, the composition of seed will not change. In the matter of viability, however, changes do occur, and it is with these changes that we are most concerned today.

The viability part of seed quality is expressed most commonly by a germination test. This test, as applied by the professional seed analyst, requires considerable judgment and experience. It also requires the application of certain techniques that are designed to give the seed an opportunity to germinate to its best capacity. There are many opportunities for improvement in techniques. Seed analysts are constantly studying this problem and are developing and will develop many more improved techniques so that this part of the operation will present a minimum amount of variability.

Then the seed analyst needs to interpret what happens during the process. Not every seed which grows a sprout or a root is considered as germinated. The seed analysts have classified germinating seedlings into several types, but roughly into "normal" and "abnormal." If for some reason, the sprout is classified as "abnormal," that seed is classified as "not germinated." During the germination process, the seed analyst attempts to provide conditions that are optimum for prompt and rapid germination. Desirable conditions of moisture, temperature, and light are provided. Attempts are made to eliminate the problem of disease. These are not necessarily the conditions the seed experiences when it reaches the field. But the test does provide a uniform basis for the comparison of different lots of seed, and it does indicate reasonably well the potential ability of the seed. In some instances, additional techniques are employed in which the seed is subjected to adverse conditions, usually low temperature, in order to show up possible weaknesses in the seed itself. Currently, many analysts are interested in methods which will indicate the vigor of the seedling during germination, as it is felt this can be translated directly to the performance of the seed in the field. No doubt improvements in this direction are ahead.

The changes in seed quality from the time it is purchased until it is sold or planted are a matter of concern to everyone connected with the seed industry. Many seedsmen have found to their sorrow that the quality of seed has deteriorated greatly, and sometimes suddenly. Seedsmen have found themselves subject to rather expensive lawsuits based upon this point. This involves not only the value of the seed itself, but also the anticipated value of the crop which might have been produced from that seed. Federal and State regulations governing the shipment and sale of seed are often involved, and the unfortunate seedsman who does have the matter of rather sudden quality losses may find himself in difficulty with the regulatory agencies.

Experience has indicated that three factors generally are involved in the loss of viability of seed after harvest and before planting. These are: (1) Time, (2) moisture, and (3) temperature. Occasionally, other factors, such as mechanical injury during handling, exposure to chemicals, etc., may be important. For many years, seedsmen and scientists have been attempting to determine the effects of these factors. Unfortunately, most of the determinations have been based upon observation and experience rather than on precise information obtained from controlled experiments.

Scientists, such as Dr. Duvel, started to determine the longevity of seed some 40 or 50 years ago as indicated by the classic experiment of buried seed by Dr. Duvel and his associates. (4) ¹⁰/ Out of that and from other types of experiments, it has been determined that certain types of seeds will live much longer than others. The results of these experiments, however, can have only a limited interpretation because the conditions under which the seeds have been stored or buried usually involve varying amounts of protection of

¹⁰/ Numbers in parentheses refer to a list of references at the end of this speech.

the seed from the factors of temperature and moisture. When both the temperature and moisture have been involved, the amounts of these factors have not been measured accurately enough or under enough conditions to be able to interpret them accurately. The experience of seedsmen has led them to conclude that high temperature and high moisture are not conducive to the maintenance of seed viability. But here, again, this is a general rather than a specific observation.

The development of the seed industry in the last 25 years makes it much more important than ever to find out a great deal more about these aspects of quality. In this period an unprecedented movement of seed from one area of the country to another has developed. Certain seed-growing areas have developed primarily for seed production. The increased demand for small-seeded legumes and grasses, in the development of a grassland program nationally, has made it necessary to produce seed far from the points of ultimate consumption and to move it about in commerce. Then too, as a result of the increased need and of high prices for seed, many new seed-growing areas have developed. As a consequence, the seed industry has had the matter of seed deterioration brought to its attention more forcefully than ever before.

In attempting to determine the facts of this situation, a search of literature reveals very little actual information. Kearns and Toole (2) were among the first to report on specific experiments in 1939. They studied chewings fescue and reported that high moisture and high temperature are directly associated with a loss in viability. In the shipment of chewings fescue from New Zealand to the United States, it appeared that a moisture content of not more than 10 percent or a temperature of 20°C. was necessary for safe shipment. They determined the specific moisture and temperature combinations that were suitable for safe storage of this crop and suggested that detailed studies be made with other crops.

McKee and Musil (3) presented a short paper in 1948 on the relation of temperature and moisture to longevity of seed of blue lupine, Austrian winter field peas, and hairy vetch. A review of the literature at that time led to the conclusion that if either temperature or moisture is high, the other must be low if viability is to be maintained within the storage period. In the experiments in which they stored peas and lupines for varying lengths of time, with varying moisture contents, and under controlled temperature and humidity conditions, they found that peas maintained viability much better than lupines.

For example, with seed at approximately 40 percent moisture and a temperature of 35°C., the germination of peas at the end of 7 days was 93 percent, while the germination of lupine was 16 percent. In another trial in which hairy vetch and Austrian peas were compared, they found that Austrian peas deteriorated in 20 months at 13 percent moisture, whereas hairy vetch maintained itself much better. However, at 15 percent moisture, both Austrian peas and hairy vetch were practically all killed, although the peas killed much more rapidly than the vetch. Their trials also confirmed observations of many seedsmen--namely, that seed varied in its moisture content from time to time during the period, depending upon the atmospheric conditions.

A study of vegetable seeds by Asgrow (1) in 1954 confirmed the importance of moisture in the longevity of vegetable seeds. For any given temperature, there was a maximum safe limit of moisture. They found, too, that different species have definite safe moisture levels for particular temperatures. Attention was directed to the fact that under certain unfavorable conditions, vigor is lost more rapidly than total germination.

A more recent work, reported by Ward and Butt (5) in 1955, with reference to crimson clover in Alabama, also showed the effect of varying humidity. In these trials, crimson clover seed which was naturally dried and that which was dried artificially were exposed to varying humidity conditions. Their general conclusions were that losses in viability after 16 weeks occurred in all lots when the relative humidity was about 65 percent under the storage conditions. The losses in germination increased more rapidly as the storage humidity increased. They concluded that crimson clover seed should be stored at moisture contents of around 12 percent or less.

With some of these conditions in mind, the Oregon Agricultural Experiment Station attempted to gather some more specific information on these points. It was decided to start the experiment with two crops: Crimson clover and perennial ryegrass. In preliminary experiments, seed of varying moisture content was stored in various types of containers, including plastic and moistureproof sacks, and under different temperature conditions. As a result of some irregularities in this procedure, it was decided to bring seed to different moisture contents and to seal them in airtight cans. This seed was then stored under three conditions of constant temperature and one condition of variable temperature to simulate warehouse storage in this area.

It is now possible to report some of the earlier results from this experiment. In the germination trials governing these experiments, attention was given to (1) total germination, (2) germinative energy as shown by the first count made at one period and by the second count made a given period later, and (3) the abnormal sprouts. Without attempting to present all of the data thus far, suffice it to say that ryegrass seed stored at 6 percent moisture and at 30°C. has shown no deterioration in 12 months. In general, ryegrass at more than 12 percent moisture began to deteriorate fairly rapidly at 22°C. Ryegrass at the warehouse site maintained itself fairly well with 20 percent moisture for about 6 months, after which it began to deteriorate rapidly. Ryegrass at 16 percent moisture followed shortly thereafter. Another interesting development was that, as the percentage of germination declined, the percentage of abnormalities increased and the vigor of germination decreased.

In considering the result with crimson clover, it was found that germination has been maintained with practically no change over the entire 12-month period of storage on seed containing low moisture and at a low temperature. An interesting development in crimson clover with 20 percent moisture was noted.

After the first month of storage, this lot was low in germinative vigor as shown by a high second count. Surprisingly enough, when this was stored at warehouse sites, the germination held up fairly well until about the seventh month. This was the result of being stored in the relatively cool winter months. Beginning with the fifth month, however, there was a significant increase in the percentage of abnormal sprouts, and by the eighth and ninth months most of the germination was abnormal. When crimson clover was held at the warehouse site, the 16 percent moisture sample held up slightly longer than the ryegrass, but afterwards the rate of deterioration was about as rapid. Likewise, the 20 percent moisture sample held up fairly well until the seventh month, after which deterioration was extremely rapid so that at the 9-month period, there was little germination. When crimson clover was held at 22°C., a deterioration of all samples above 12 percent was almost immediate. Even at the 12 percent level, deterioration began to occur after the ninth month.

These few data represent something of the interaction between temperature and moisture with respect to seed viability, and when the study is completed, it should give a fairly accurate picture of the situation with these two particular crops. However, it is evident from variations experienced with other kinds of seed that the study should be extended to other seed crops which are important in the region.

In connection with the moisture studies cited above, some preliminary tests were made of grass seed stored in western Oregon warehouses. To the amazement of the project leader, some of these samples showed moisture contents as much as 14 percent. This had led to the development of another study of a survey nature. In this study the experiment station and the State department of agriculture are cooperating in a survey of what is happening to a number of different kinds of seed stored under various conditions in western Oregon.

The seeds in question are: Crimson clover, ryegrass, tall fescue, chewings fescue, bentgrass and sudan grass. These seeds are stored under normal warehouse conditions in the following types of storage: Frame houses, wooden floors; frame houses, concrete floors; metal houses, wooden floors; and metal houses, concrete floors. These represent the usual type of storage in the area. The seeds are stored in ordinary burlap bags and will be sampled monthly during the 2-year period. Determinations will be made of moisture and of viability each month. An attempt will be made to obtain humidity readings at the time of sampling and to use local weather data to interpret changes which may have occurred. This study should give a fairly accurate picture of what is happening, and, when combined with the study on interaction of temperature and moisture with various seed crops, should make it possible to protect seed against undue losses as a result of storage conditions.

When a sufficient amount of basic information is available, it should be possible to interpret the effect of storage in various areas and under different conditions on the quality of seed and the changes in quality which might be expected to occur. The application of such information to the conditions of seed storage and seed transit should make it possible to effect substantial reduction in deterioration of seed between the time of harvest by one grower and its ultimate use by another.

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CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING GRAIN AND SEED BY
MINIMIZING DETERIORATION AND CONTAMINATION

To carry out more effectively overall marketing programs in the various States, it is recommended that service agencies cooperate with other agencies in organizing marketing committees for the purpose of solving grain marketing problems. The size and scope of this committee should be determined by State and local conditions. This committee could be composed of service, research, extension, regulatory, farm, and local organizations, and other allied industries. It is recognized that conditions vary for handling, conditioning, and storing grain in different areas. Therefore, the programs must be varied in accordance with the needs of each State.

The work group on reducing costs of marketing grain and seed by minimizing deterioration and contamination arrived at the following recommendations:

1. Develop rodent and bird control programs in grain-producing States, similar to the service work under way in North Dakota, to prevent deterioration and contamination of grain in storage and in transportation facilities.
2. Develop programs to encourage the construction of proper facilities to keep out rodents and birds, periodic inspection of grain in bins, and the proper use of sprays and fumigants where needed as control measures.
3. In areas where dryers are profitable and practical, continue to give technical assistance in the proper use of drying equipment to turn out quality seed and commercial grain. Volume of air, humidity and temperature control, and moisture content are important factors in the control of the quality of grains and seed.
4. Encourage research to obtain specific information on the effect of moisture and temperature as it relates to the germination of seed and grain conditioning. When available, these research findings should be used as the basis for developing quality seed programs and in maintaining the quality of grain in storage.

REDUCING COSTS OF MARKETING GRAIN BY
IMPROVING HANDLING METHODS AND EQUIPMENT

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Improved handling methods and modern equipment not only are a help in reducing the cost of operation, but also are necessary if one is to stay in the grain business and meet competition. The southwest quarter of the State of Kansas is one of the largest wheat-producing areas in the United States. For the past several years, there were many times when the support price of wheat under the government loan program had been higher than the cash market price. On the occasions when the cash price was higher than the loan price, quality and variety played a very important part.

Since the loan price of wheat has usually been higher than the market price, most of the wheat received at the country elevator level has been for storage for the producer, and it has a direct bearing on the types of elevators that have been built and the types of equipment that have been installed in these elevators.

With the coming of modern equipment for producers, the combines and the custom cutters, the harvest period has been stepped up to a point where the harvest is completed in about 10 days. This has created a demand on local country elevators to assemble, grade, condition, and ship wheat at a very rapid pace. It is not uncommon for country elevators to receive and process over 100,000 bushels of wheat in a day during the harvest period. They must be able to receive this volume, separate the high from the low moisture wheat, and keep certain varieties apart, as some varieties will command better prices than others.

A few modern elevators were constructed prior to the war, but most of them have been built since 1945. There is hardly a town or community in this area without a modern concrete elevator, and most of them have been built by local farmer cooperatives. Since most of the wheat goes into storage, the elevators fill up and loans are obtained by the producers. In too many cases, the cash market does not go high enough that the producer can redeem his loan. If a loan is not redeemed by a certain date in the spring, title to the grain passes to the Commodity Credit Corporation. Until this past year, storage space has been so short that the Commodity Credit Corporation has not been able to move the wheat before the following harvest. The country elevator then had no storage space for the oncoming crop. The result was that many of these local elevators added space, either by annex or by building a new elevator.

The cost of building new country elevators has almost tripled in the past 15 years. An elevator with a storage capacity of 250,000 bushels in 1941 cost \$58,000. That was a little over 23 cents a bushel. The same elevator today would cost between 60 and 70 cents a bushel. Up to a certain point, the larger the elevator, the less cost per bushel. Conversely, the smaller the capacity the higher the cost per bushel. It is not practical to build an elevator with a capacity of less than 150,000 bushels as it would cost between 90 cents and \$1 a bushel. The earning capacity of this size elevator would hardly pay the cost of construction.

Most elevators have been designed so that up to 350,000 bushels are gravity flow. If more space is needed, a row of tanks alongside the head house is added, and conveyor belts are used to move grain in and out of these tanks. With gravity flow, all tanks empty into either the receiving pits or directly into the boot under the leg. All tanks are hoppers so that grain will empty out without shoveling. The driveway passes through the center of the elevator, and a good elevator is designed so that grain in all of the overhead bins, as well as part of the larger bins, will drop through the driveway. When grain is dropped through the driveway, it can be cooled and treated for weevil when it is turned. The more grain that will flow by gravity, the less it will cost per bushel to turn and condition.

Cheaper storage has been built. There again, it depends upon the design and the equipment. In a few cases, flat storage has been constructed in this area at a cost of about 30 cents a bushel. However, flat storage is not recommended unless equipment is installed so that the grain can be easily turned and fumigated. Too often this has not been done. As a result, a considerable amount of grain has gone out of condition with substantial money losses.

A country elevator manager, in receiving wheat at harvest time, must watch and test the grain for moisture content. As a general rule, a country elevator manager will not try to keep wheat of more than 12 to 13 percent moisture in his own elevator for storage. There is no assurance, however, that wheat of 12 percent moisture or less will stay in condition even though turned. In 1951, wheat in a number of the country elevators went out of condition because of a certain chemical reaction. Wheat coming out of these elevators graded sample grade on account of total damage. Total damage occurs only because something has happened to make the temperature rise, and temperatures usually rise from moisture or weevil infestation.

After this experience, many of the country elevators installed temperature control systems. This device consists of a cable installed down through the center of the tanks with thermo-couples at 6-foot intervals. These cables are wired to a temperature recording machine so that temperatures can be taken at 6-foot levels. These readings are taken every 7 to 15 days. The readings are recorded and compared with previous readings at the same levels. If there is a rise in temperature at any of these levels, the grain must be turned and conditioned. These temperature control systems can be installed at a cost from 6 to 10 cents per bushel capacity, depending on whether they are installed in every tank or only in the larger ones.

The installation of this system saves needless turning, thereby saving costs in power. It also cuts down on dockage accumulation. Every time wheat is turned, the berries crack and chip into pieces small enough to go through a dockage sieve. The wheat could be graded dockage if more than 1 percent is damaged.

A few of the larger country elevators have installed grain dryers. The cost of operating a dryer and the shrink that will be encountered many times will be more than the market difference on moisture wheat. One of the local cooperatives in our area installed a dryer and kept accurate figures on the cost of operation. A typical example of the cost is disclosed in the following figures. The dryer cost approximately \$27,000 installed. Its estimated life is for more than 2,000,000 bushels. It has an average capacity of 400 bushels per hour. The cost of operating is \$3.75 an hour for gas, \$3 an hour for labor, and 30 cents an hour for electricity. Upkeep and depreciation are estimated at \$6 an hour. These costs amount to about 3 cents per bushel. In addition, shrink will amount to about 1-1/2 percent for every 1 percent of reduction in moisture content. It was found that the dryer could be operated only on certain days to obtain the best results. It could not be operated on days when the humidity was high. It also was found that the dryer operated much more successfully on grain sorghums. Sufficient discounts could be taken on moisture milo to pay the cost of operating and the shrinkage.

The Farmers Cooperative Commission Company is a regional cooperative, serving 121 local grain cooperatives in southwest Kansas. In 1954, the last unit of a 10-million-bushel elevator was completed in Hutchinson. This elevator cost approximately 40 cents a bushel. There are over 600 storage tanks. The tanks are hexagon-shaped, and each holds about 18,000 bushels of grain. The head house is in the center with two units of tanks on each side. Each unit is built in clusters, 6 rows wide and 48 tanks long. They are served by 2 conveyor belts in each unit, using the same belt for putting the grain into the tanks at the top as well as taking the grain out at the bottom. The hexagon shape is advantageous for several reasons. Because of the shape, only 4 conveyors are required instead of 6 with round tanks. In theory, all of the elevator could be turned with one empty tank, thereby utilizing more space. The smaller number of conveyors reduces the cost of operating.

A mechanical car dumper was installed at the time the first unit was constructed. This dumper can be operated by 1 man and can unload about 8 cars an hour. Under the old system of unloading, power shovels were used. This system required 2 men. At the most, 3 cars could be unloaded in 1 hour. It is difficult to hire men to operate the power shovels, as the work is hard. This dumper cost \$130,000 installed. It provides a saving not only in operating costs, but also on demurrage charges.

The Commission Company recently has completed the installation of a bulk fumigant system, permitting the purchase of fumigant in bulk instead of in 5-gallon cans. Bulk purchases will result in a reduction in cost of 43 cents a gallon.

Before the coming of combines, turkey types of wheat were raised almost exclusively in this area. After combines came into use, many producers were dissatisfied with this type of wheat. It matured too late, and producers started looking for a variety of wheat that would yield more per acre. New varieties were developed which were more desirable to producers. However, the strong gluten quality of turkey wheat was not bred into some of the newer varieties. The result was some varieties that were desirable and some that were not so desirable.

Several years ago, a great many interior mills were grinding wheat into flour that was sold almost exclusively to families for family baking. As times changed, and more and more housewives bought their bread from the grocery store, this type of flour-milling business began to pass out of the picture. A number of mills closed. The larger mills turned to commercial bakeries for their markets. Commercial bakeries used mass production methods and high-speed mixing machines. They began making some exacting demands on the millers for certain qualities of flour. To meet these specifications, the millers in turn began to make certain demands on the grain trade for certain qualities of wheat.

Some years ago, the Farmers Cooperative Commission Company added to its staff two men who do nothing but make an analysis of every sample of wheat, representing each car consigned to the Commission Company. It had been learned from experience that certain varieties of wheat normally follow a certain pattern and contain either strong, mellow, or weak gluten qualities. In making this analysis for each sample, the percentage of the various varieties it contained was recorded. If the wheat was unloaded at the company's elevator, it was placed in bins, not only according to test weight and protein but also according to the variety. Mill mixes were developed from these bins.

This was a hit-and-miss method. It was found that climatic conditions affected the quality of wheat, and some of the so-called stronger varieties did not come up to expectations. The Commission Company installed its own mill-testing laboratory, which was the first ever installed in a terminal elevator in the United States. The company is able to run tests on various lots of wheat and mix and blend until a satisfactory mill mix is obtained. It is able to furnish mills actual mill tests on particular bins of wheat. This equipment costs money and is an added operating expense, but it enables the Commission Company to build up stocks of milling wheat that is in demand by the mills and to command better market prices for its product.

The Commission Company has learned from experience that the best equipment is the cheapest in the end. If newer and better methods are developed, it will be among the first to accept and install such methods. In many cases, newer equipment and methods cost more to operate, but the end product obtained through their use will command premium prices in the market and a better service will be rendered to customers.

Time does not permit me to go into all phases of the operations of elevators in our area, both from the country and the terminal point of view. The few examples that I have given show that operating costs can be reduced by improved methods and up-to-date equipment.

REDUCING COSTS OF MARKETING SEED
BY IMPROVING HANDLING METHODS AND EQUIPMENT

W. K. Farris, Jr.

Alabama Department of Agriculture and Industries

Alabama and the Southeast, in the last 15 years, have become one of the largest seed consuming and producing areas of the United States. Until recently, however, the quality of seed produced in this area has been very objectionable due to its haphazard treatment prior to marketing. The last several years, however, have seen a remarkable increase in the quality of seed that goes on the market in Alabama. We like to think that we had a small part in this quality improvement.

The program on seed quality in Alabama was started in the fall of 1951. Since the production and marketing of quality seeds is the ultimate goal of the program, assistance is given wherever and whenever our qualifications and experience permit. But, in the main, our efforts have been concentrated on the processing of seed.

During the years that this program has been in operation, it has been found that the operator or manager of a processing plant will give his complete attention to one who can show him where or how he can save money. Every processing plant has its own individual problems, and it is almost impossible to dictate a blanket policy of positive savings to every processor. Labor is an important cost factor in any cleaning plant, as well as in any industry at this time. Therefore, increasing the efficiency of labor and minimizing the amount of labor needed are ways by which marketing costs may be reduced.

Our interest in the seed starts at the time it is harvested, and continues until it is offered for sale. Our economy move, therefore, must begin in the field if possible. Due to high temperatures and humidity, 9 out of 10 lots of seed harvested in Alabama should be artificially dried or aerated within 2 to 4 hours from the time they are harvested. More and more farmers are becoming aware of this requirement.

Seed is delivered to the plants in one of three ways: (1) In bags or sacks; (2) in bulk, on trucks or wagons; and (3) in steel bins furnished by the processor. The first two methods are as old as harvesting itself. The third method is the newest and the most economical and convenient to use with limited sizes of seed lots. The bins can be handled easily with a forklift truck. The farmers load them on their trucks, haul them to the field, fill them up directly from the combine, and return them to the plant. The bins are numbered, and the seed remains in them, except during the drying period, until it goes into the bag as a finished product.

The same forklift truck saves labor in handling the bagged seed on pallets. The lower the number of times the seed is handled by laborers, the more economical the operation. The installation of some pieces of machinery or equipment will cut down the cost of labor and at the same time increase the efficiency of the operation. The location of the dryer in relation to the rest of the plant, the accessibility and the method of loading the bins, the method of unloading the bins or conveying the seed to the processing machinery, and the method of getting the seed into the machines must be considered.

(Note: A series of slides were shown to illustrate these points. These slides showed the dryer located in the back of the plant, with each bin or drying chamber readily accessible. By use of a portable auger conveyor, one laborer can load the bins. The bins slope to the back, at which point a trap door allows the seed to be dumped in the middle of a belt conveyor. The conveyor, in turn, dumps the seed into the boot of a rough-seed elevator. The elevator picks up the seed and dumps it into a huge hopper over the cleaning machinery. After the seed has reached this point in the processing operation, laborers do not need to touch it until it is bagged.)

Three general suggestions for reducing operating costs and increasing plant efficiency are:

1. The installation of all types of machines that will (1) reduce or eliminate the amount of unnecessary material required to go over or through a machine, or (2) increase the capacity of the present equipment. An oat debearder is a machine that does such a job. It allows the rough seed to be put in, and the beater arms inside the machine pulverize the sticks and trash, doubling the capacity of the screen air machine that usually follows next in the operation. This machine is only one of several that will help in the operation of a cleaning plant. All are inexpensive and will pay for themselves the first year.
2. Elevators or conveyors should be installed at every point where seed must be moved outside the cleaning machinery. A little thought and care practically will eliminate the necessity of handling any seed from one machine to another. Elevators are inexpensive and fit every need. They are long-wearing and will save many dollars in labor cost.
3. Large bagging bins and seed hoppers should be installed in a cleaning plant. The largest bins an operator can build or afford will be the most economical, time-saving, and convenient to his operation. All seed-cleaning machines run better and more efficiently if there is a constant flow of seeds, and a large bin will make this possible. When a large bin is full, the machine for the preceding operation may be shut off, thus bringing about a saving. The capacities of machines vary, and the large bins over slower machines can be filled, the machine started and adjusted, and the operator can forget about it for a while. Large bagging bins will enable the operator to clean several lots of seed and bag it at a later time, eliminating the need for a bagger all the time.

This discussion covers only the high points in reducing costs in seed processing plants. However, a seed processor first should consider these suggestions before looking for other possibilities. Each plant is constructed differently and may require different treatment. But there are always some means of improving efficiency and cutting down operating costs in every plant.

REDUCING COSTS OF MARKETING GRAIN BY IMPROVING DISTRIBUTION AND STORAGE FACILITIES

William L. James, Jr.
Virginia Department of Agriculture

This discussion is a summary of some work and developments that have taken place during the past few years in Virginia. Surveys or studies of grain producing areas in that State have been made to determine the need of handling and storage facilities. These area studies cover 4 to 8 counties, depending on the size of the production area, and are made in cooperation with the extension personnel in the area. Information is obtained on: (1) Acreage and production of grains, (2) existing markets and handling and storage facilities, (3) number of harvesting units, (4) amounts to be sold at harvest and amounts to be stored, (5) climatic conditions at harvest, and (6) other factors that are essential in determining handling and storage facility needs in the area.

Tabulations of the information obtained from these surveys show for most areas the handling and storage facilities that are needed. Past surveys have shown that:

1. New handling or storage facilities, or both, were needed because there were no facilities in the area.
2. Handling and storage facilities in the area existed, but were not sufficient to take care of the grain movement.
3. Some existing storage facilities were large enough, but the volume handled was insufficient for proper and economical operation.

If a new facility is needed and is going to be built, information from the survey in the area is given to the interested parties building the facility, along with other information concerning the location and type of facility.

If the grain is to be moved away as fast as it is received from the farm, only a minimum amount of storage space is needed. If the grain is to be held for any length of time, adequate storage must be provided. If grain is to be dried or fumigated before shipment, more space for holding and turning is needed. In the new facility, provisions should be made for at least two (perhaps three in corn-soybean areas) grain receiving pits, a hoist for dumping trucks at each pit, sufficient scales, and conveyor and elevator equipment. Additional equipment such as shellers, dryers, and cob eliminators should be considered.

In areas where the handling and storage facilities are not sufficient, recommendations are made to enlarge the storage and to remodel the handling facilities. Most of the existing wheat storages in the State were old and were built for operations 25 to 40 years ago. There were no bulk unloading facilities. Existing conveyors caused slow unloading and slow turning or movement of grain. There were no grain dryers, and the facility was usually set up for only one operation at a time. Several elevators have added additional storage, pits, and hoists for bulk unloading, new conveyors and legs to move the grain faster, a grain dryer to dry high-moisture grain, and loading-out facilities. For example, 6 years ago, a 70,000-bushel capacity elevator could take in bagged wheat at the rate of 200 bushels per hour. It took approximately 45 hours to turn one bin of grain into another bin. There were no drying facilities. The mill could not take in and load out grain at the same time. By speeding up the conveyors and adding more buckets to the up belts, the elevator can take in over 800 bushels per hour and can turn a bin in 8 hours. A grain dryer was added along with two elevator legs, and a bulk dump pit and unloader were installed. Now bulk or sack grain can be unloaded, grain can be dried, and bins may be turned or grain loaded out all at the same time.

During the last few years, several farmers in the small-grain producing areas of Virginia have remodeled or constructed farm storage facilities. A 3-year study in these areas showed that small grains could be stored safely, but that, to store it safely, it had to be stored properly. To store grain properly, first a good storage facility is needed. Some requirements of a suitable facility are: Weathertight roof, floor and sides; strong enough construction to hold grain; protect from birds and rodents; arrangements for proper fumigation and sampling; and ability to move the grain in and out of storage properly.

The farmer must have a good grade of grain to store. The grain should have a low moisture content, be clean, and have a low damage content. The bins should be cleaned and fumigated before the grain goes into them. When the grain is in storage, periodic checks should be made for weevil, rodents, or any condition that will lower the quality of the product. When signs of live weevil are found, the grain should be fumigated.

Farmers who erected storage 5 years ago at a cost of approximately 40 cents per bushel already have paid for them on the amount saved by not having to take deductions when they store their grain in commercial elevators.

In Virginia, there are many local feed manufacturers, and about 65 percent of the corn used in local feed manufacture is grown in Virginia and North Carolina. During the past few weeks some out-of-State manufacturers have been changing their process of mixing. They are shipping the packaged ingredients into Virginia to their feed retailers, and the retailers are buying local corn,

grinding it, and mixing it with the packaged ingredients. The savings in freight charges by use of this method means a saving of at least \$10 a ton to the consumer. Because of the marketing and grading services offered at both the shipping and receiving points, local feed manufacturers and the new-coming feed mixers can obtain corn from Virginia or other States, and are able to check on the quality and keep it at the level they desire for use in their feed.

Truckers in Virginia are an important factor in the movement of grain from the production area to the consuming area. Most feed manufacturers are located from 150 to 250 miles from the grain-producing areas in the State. Of the corn that is moved within the State for feed manufacture, trucks move about 75 percent. These truckers can buy and sell on a graded basis, thereby eliminating a great part of the risk involved in the buying and selling.

Virginia has 19 permanent and temporary marketing centers located throughout the State. Such centers are located in all of the large grain-producing areas as well as in the areas where a large percentage of the feed is manufactured. At these centers, farmers, grain buyers and handlers, truckers, feed manufacturers, or any other interested party may get grain sampled and classified. They also may obtain information on prices and markets throughout the State and on fumigation and storage of grains grown in the particular area.

FEED MILL LABOR EFFICIENCY 11/

W. S. Farris

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One of the ways by which a business can increase its gross margin of profit is to cut its operating costs. Increasing the efficiency is one of the ways to reduce these costs. This can be done by increasing the output per unit of labor--that is, by doing more with the same labor force, or by doing the same job with less labor. Purdue has conducted some research on the development of work methods designed to increase labor efficiency in grinding and mixing feeds by country elevators. Through a detailed study of work methods, time requirements, and actual amount of work performed in several different feed mixing and grinding operations, possible changes can be illustrated that hold promise of improving the use of labor in grain elevators and feed mills.

11/ Based on a cooperative study with the Indiana Farm Bureau Cooperative Association, Inc., and the Indiana Grain and Feed Dealers Association, Inc., and reported in Purdue Agricultural Experiment Station Bul. No. 639, "Labor Efficiency in Grinding and Mixing Feeds in Indiana Grain Elevators," by C. E. French.

Revolutionary changes were not expected for feed grinding and mixing work in Indiana elevators; rather, the respective jobs were broken down into small parts for individual study. The operations that were the most time-consuming, especially the ones in which the application of labor-saving principles would cut out some of the delays, were selected for detailed study. The suggested improvements that resulted may not appear to save a large amount of labor when they are considered separately. But, when several of them are combined, they result in a substantial increase in labor efficiency.

For purposes of this study, the total time during the workday--that is, time for which workers were actually paid--was divided into two classifications: Working time and idle time. Basically, the job was to improve the use of working time and to eliminate as much idle time as possible. The work time was divided into five classifications, as follows: (1) Office work, (2) receiving, (3) grinding, (4) mixing, and (5) moving feed to customer's vehicle.

Of the elevators studied, it was found that some were mixing and grinding more than twice as much feed per hour as others with supposedly comparable arrangements. This type of variation was an indication that a chance for improvement existed in the use of labor in many elevators.

Some of the problems encountered in the important operations are considered below, together with suggested improvements.

1. Office work. The weighing and recording of weights in the office take time and thus are a cost item. The weights also form the basis of payment, and, since customers are very sensitive where the exchange of money takes place, here is an area where good customer relations should be promoted. The major variation in work methods in the office is between the use of an automatic scale and a hand-balanced scale. Hand-balanced scales take 31 percent more time to handle a load of grain than automatic scales. It takes about a half minute per load longer to hand-balance and read the weight than merely to read the weight. The time required for this operation can be reduced further by using the stamp with the automatic scale. Speeding up this operation may make for better satisfied customers as well as save time for the office help.

The type of weight sheet used can be an important consideration. An additional posting--even on the same page--takes an additional one-tenth minute per weight posted. Allow about one-half man-minute per weight posted if an account must be located for each entry. The use of calculating equipment helps speed calculations and reduces errors. The office help can sometimes draw up tables showing calculated charges for the usual order sizes during slack periods. The manager should encourage settlement of accounts on the day of sale. It was found that to settle old accounts took twice the work.

The manager sometimes may sacrifice needed management time to do clerical work. It might be profitable to relieve the manager of this work and give him more time for actual managing.

Adequate office facilities may add greatly to the overall efficiency of the elevator work. A conveniently arranged private office is greatly appreciated by customers and is especially advantageous to management. Offices should be planned to facilitate display, give customer service, allow management access to personnel supervision, and minimize dust, noise, and traffic congestion. One should plan at least a good compromise of these factors.

2. Receiving. In the job of receiving feed for grinding and mixing, the unloading operations were the most important. They accounted for about 32 percent of the receiving time. Thirty different work elements were involved in the usual receiving procedures. Total standard time requirements for this work amounted to 7.6 minutes. The unloading took 2.4 minutes, nearly one-third of the time, and the delay for grinding took 1.4 minutes, nearly 20 percent of the time. The main differences in efficiency of methods were between the use of wheel hooks and a cradle-type hoist. Unloading with wheel hooks took nearly 50 percent more time than with the cradle-type hoist--2.4 minutes per load with the wheel hooks and 1.6 minutes per load with the cradle-type hoist. Not only did the wheel hooks take more time in unloading, but the chance of damage to fenders was considerably increased with the wheel hooks. A few elevators have installed an overhead safety cut-off switch for hoists to prevent lifting truck cabs high enough to damage them. All sizes and kinds of loads received for grinding and mixing make it important that receiving facilities be flexible. If the receiving facilities for grinding and mixing are separate from those used in receiving grain for storage, much delay is eliminated. The need for coordination of receiving facilities is illustrated by the fact that 29 percent of the receiving time was spent in delays, not including long waits between loads.

The size of the dump pits turned out to be an important factor in receiving grain for grinding and mixing. Many dumps were too small, which required more time for the actual unloading operations and greatly increased the amount of sweeping that had to be done around them. Sweeping time accounted for 6 percent of the time for receiving. Some of it, however, was unnecessary. For the necessary sweeping around dumps, a good broom should be permanently located nearby. Many of the brooms were labor wasters because they were either too small or worn out. In many instances, the workers had to hunt for them for some time before they could locate them. The dump openings, therefore, should be large enough to eliminate most of the sweeping, and the dump capacity itself should be large enough to minimize delays.

Repair or remodeling of conveyors in the dumps could eliminate some of the time spent in punching the grain down. This operation accounted for about 9 percent of the entire receiving time. Chains can be set at an incline, or a larger auger can be used to eliminate this problem.

Two other arrangements seemed to improve the receiving operation. These were: (1) Arranging the elevator spout so that it could be changed from the ground floor, and (2) keeping the switch arrangement as compact as possible. The sheller, drag, and elevator switches should be located near the most frequently used dump.

3. Grinding. The grinding operation took 1.2 minutes per load. Grinding capacity should be fitted to volume. Where adequate grinding capacity was provided, there were fewer delays. The delay for grinding accounted for about 19 percent of all the receiving time. The operation that took most of the man-labor associated with grinding was changing the screens. To improve this operation, screen changes should be made from the grinding floor instead of making a trip to the basement, down a stairway, ladder, or manlift. Incidentally, the stairway proved quicker than either the manlift or the ladder. There appears to be an opportunity for some elevators to reduce the number of screen changes. The elevators studied used as many as 7 screen sizes; however, 4 of these accounted for 92 percent of the orders. The four most frequently used screens were: 1/8 inch, 1/4 inch, 9/16 inch and 1 inch.

Operators could achieve some increase in efficiency by discouraging unusually fine grinding. A ton of shelled corn, for example can be ground coarse in one-third the time required to grind oats fine on the same grinder. Fine grinding probably cannot be eliminated, but some reduction in the amount of fine grinding appears possible.

The use of two grinding bins added considerably to the flexibility of the grinding and mixing operation. With two bins, the receiving operations could continue without delay while grinding and mixing were being done from the other bin.

4. Mixing. Standard time requirements for mixing a load of feed turned out to be 2.5 minutes. Thirteen separate work elements were involved in the mixing operations. Considerable travel was involved in the mixing operation, mainly because the addition of supplement was required, and, in many instances, the supplement was stored some distance away.

Orders generally required 1 to 3 bags of supplement. It took almost as much time to get 1 bag or even a part of a bag as it required to get 4 or 5 bags when the work was performed with a hand truck. If supplement can be stored near the mixer, it is usually quicker to carry or slide the supplement to the mixer. Where supplement was stored 100 feet from the

mixer, it required $3/4$ of a minute to make a round trip. If long trips with a hand cart cannot be avoided, it saves time to move a full hand cart of supplement each trip. Supplement stored upstairs required $1/3$ more handling time than storage on the mixing floor, even when hand carts and slides were used. This suggests that every effort should be made to store the supplement on the mixing floor and as near the mixer as is practicable. Some of the labor required for mixing could be saved if the most frequently used supplements were stored nearest the mixer. Indiana elevators frequently violated this work principle.

Additional savings in the mixing operation may be possible by pre-packaging antibiotics and minor elements in quantities determined to be appropriate for the most common order sizes. Companies which furnish these might put them in smaller packages. Weighing out less than a full sack of any material was observed to be time-consuming.

Attention to detail may save mixing time. For example, opening bags took nearly $1/6$ of the mixing time. Pre-positioning a knife would save needless time looking for it. Workers were observed in a few cases to walk 10 to 15 feet to dispose of each string removed from a sack. A receptacle near the mixer should eliminate this delay. In elevators with only one mixer, there was occasionally a wait for the grinding to finish. Ordinarily, the wait was not long enough to permit the workers to start some other job. In elevators with two mixers, work can be coordinated so that while feed is being ground and mixed in one mixer, another feed order can be "bagged off" or "bulked off" from the other mixer. An extra mixer has several advantages, but better use of the worker's time is an important one.

5. Moving feed to the customer's vehicle. The actual transporting time for moving sacked feed to the customer's vehicle was not great, but the sacking operation itself was time-consuming. For the average worker, about one-third of the time required for this operation was spent in tying sacks. It is especially important that the person tying in a two-man operation be able to keep up with the bagger. If the tying job seems to be a bottleneck, some training may well pay for itself in time saved. If workers will pre-position sacks and string during odd times, it will eliminate some of the delays in sacking and handling the sacked feed. Some elevators make good use of chutes, slides, and conveyors to move sacked feed to the customer's vehicle. If volume of feed business will permit, equipment of this kind might well be substituted for the labor necessary to move the sacks out by hand or transport the feed by hand truck.

Many elevators are equipped for handling bulk feed. Bulk delivery appears to be growing in favor, on the part of both farmers and feed dealers, and it seems to be a natural development to save labor on the farm. The extent to which elevators can use bulk handling of feed, of course, is dictated by the facilities on the farm. As more feed is delivered by the bulk method, elevators can look forward to further mechanizing their feed mixing and grinding operations. It will save labor for them and, in some instances, may help increase the volume of business.

Some general considerations which do not fit specifically under the headings previously mentioned may be worth noting. Many of the operations connected with the feed mixing and grinding work have certain fixed times. On these parts of the work, efficiency can be increased by increasing order size. Order size, of course, varies widely, and the elevator must maintain a flexible operation to handle varying sizes of orders. However, any adjustments which the management can make to reduce this variation should tend to improve efficiency of labor. Quantity discounts may be one means of encouraging larger orders.

General backtracking of employees from job to job was observed. Some planning of the sequence of jobs might allow circular travel to be practiced, thereby eliminating much of this backtracking. Sometimes the most used materials are stored in the most out-of-the-way places. Specialization of labor in the feed mill apparently was carried too far in many cases. With relatively small crews, each man should be able to do most of the jobs. This method allows flexibility of the operation and reduces idle time. Poor house-keeping and poor lighting resulted in lost motion in many places. Sometimes poor employee instructions and scheduling caused poor work methods. A good intercommunication system helps, but even here the manager must give special care to provide clear instructions.

Small tools, such as brooms and shovels, were often lost. They should be duplicated, and each put in its place. Saving of a few minutes each day, spent in looking for a broom or shovel, will soon pay for one of these small tools.

Many of these suggestions are small items. Most of them, however, are inexpensive. When added together, they may result in a substantial improvement in labor efficiency in the elevator. Managers can do some of this type of efficiency research for themselves if they will take time to look around, visit other elevators, and then criticize their own operations. Feed mills and elevators should be operated as efficiently as possible. It means a better distribution system for marketing grain, and it helps keep our competitive economy healthy.

CONCLUSIONS AND RECOMMENDATIONS ON REDUCING COSTS
OF MARKETING GRAIN AND SEED BY IMPROVING HANDLING METHODS,
EQUIPMENT, AND DISTRIBUTION AND STORAGE FACILITIES

(Note: Because the handling methods and equipment used in the marketing of grain and seed are so closely related to the distribution and storage facilities, the two work groups discussing these topics made a joint report on their conclusions and recommendations.)

The two work groups concerned with these subjects recommended that consideration be given to the development and expansion of service programs in the following categories:

1. Insitute and expand marketing service programs to improve the quality and reduce the cost of seeds that are put directly into the marketing channels by providing assistance in the installation of equipment, processing and handling methods, and other plant operations. This type of program is currently under way in Alabama and Georgia.
2. Initiate and expand programs to improve the efficiency in handling methods and in the use of handling equipment for grain along the lines of work now being conducted in several Southeastern States. In connection with this program, marketing specialists provide assistance with respect to kinds of equipment and the adjustment and installation of machinery and equipment best suited to grain handling and storage operations.
3. Develop programs to provide assistance on installing and adjusting aeration and drying equipment. Available research findings indicate that it is possible to reduce costs in turning and fumigating grain in storage through the use of aeration systems. Additional research is necessary to supplement currently available information in order to make possible the development of effective service programs in this field of work. Consideration also should be given to the following types of work: (1) Development of more economical types of drying and aeration equipment, particularly for smaller types of operations, and (2) encouraging the more extensive use of drying equipment for as many kinds of grain and hay crops as possible in order to reduce the unit cost of preparing grain and similar crops for market.
4. Develop more research on the utilization of available flat storage in the Southeastern States. For example, tobacco warehouses and similar types of structures may be used for storing grain, providing drying and aeration are possible and economical.

5. Conduct programs that show producers and handlers of grain and seed how to improve their marketing methods from farm level to retail outlets. An important phase of such a program is conducting demonstrational meetings and short courses to provide assistance in the use and adjustment of harvesting equipment, maintenance of handling equipment, use of grade standards and sanitary requirements, improving methods of grain sampling at producers' point of sale, and encouraging efficient marketing practices in buying and selling.
6. Develop coordinated programs between States with respect to the most economical trucking arrangements available for the transportation of seed, grain, and grain products to market. The use of back-haul loads and the development of cooperative trucking arrangements should be encouraged as a means of bringing about reductions in transportation costs for grain products.
7. Expand programs to disseminate grain quotations by various grades at local points, increasing the number of locations and utilizing all media of publicity as a means of promoting a coordinated and an economical grain and seed marketing program.

The recommended program can be accomplished by State marketing people through individual assistance to farmers and by cooperative efforts with other State and local agencies. State agencies should expand their programs through a greater use of radio, newspapers, and television. It also is recognized that additional personnel is needed to expand and carry out these programs.

LIVESTOCK AND MEATS
(Work Group Sessions)

REDUCING COSTS OF MARKETING LIVESTOCK AND MEATS BY
PREVENTING LOSSES AND DETERIORATION

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The marketing of livestock entails the consideration of economic and product losses which occur due to a variety of reasons. These losses can be attributed to the following general areas or causes: (1) Bruises, (2) deads and cripples, (3) shrink of livestock, (4) disease, (5) parasites, and (6) economic losses. Although economic losses are placed last, they are certainly one of the most important considerations, for it is possible to motivate action to reduce livestock marketing losses when the pocketbook is involved.

It has been conservatively estimated by the U. S. Department of Agriculture and by Livestock Conservation, Inc., that these monetary losses are in excess of \$50,000,000 a year. This loss is shared by the whole livestock and meat industry. In my company, the beef division has closely determined its losses due to bruising and devaluation of meat cuts at slightly more than \$2,000,000 a year. You can well appreciate the fact that livestock buyers consider these losses when determining the price they are able to pay for livestock.

Bruising can be greatly reduced, for most of it is within the power of man to control. Careful handling and quiet movement of livestock by producers, transportation and marketing interests, as well as meat processing personnel, have proved this is true. Proper equipment is also necessary to prevent bruising. The loading and unloading facilities available, the vehicles used to move the livestock, the condition of the sorting pens, scales, scale gates, alleys, and types of animal persuaders used, all affect the condition of livestock destined for slaughter.

The grade and condition of animals are closely correlated with the amount and seriousness of the bruising. According to Livestock Conservation, Inc., the national organization which is concerned with livestock loss prevention matters, one packer found that 5 percent of the steers were bruised, 5-1/2 percent of the heifers were bruised or damaged, and shipper cow bruising was 15 percent and up. The monetary loss on the above classes of livestock ran from \$7 a head on the cheaper grades to \$15 on the top grades.

Horns are also an attributable cause of bruising. Dehorning, or proper tipping of horns, can greatly reduce the incidence of bruising.

The number of deads and cripples arriving at a market accounts for much of the heavy losses and varies in percentage of incidence by grade similar to the packer bruise study above. The condition of the animals arriving at the market is greatly affected by many causes, some of which are: Faulty nutrition; the presence of diseases and parasites; the failure on the part of the farmer, trucker, or transportation agency to observe proper precautions against extremes of weather and road conditions; failure to check on the load; sudden stops and starts; taking the curves too fast; failure to bed the animals properly; overcrowding of the livestock in transit; too much hurry in loading; overfilling before starting the trip to market; jumping animals out of the upper decks; failure to back the truck properly against the dock; projections in alleyways and pens; sharp corners; slippery footing; parking in the hot sun; stopping too long for gas and food; mixed species without regard to partition; and no bull tie-up.

To aid market specialists, producers, and truckers, Livestock Conservation, Inc., has prepared a pamphlet entitled, "How Many Animals Make a Load?" This booklet has been standardized for use in all parts of the country, and is a very valuable guide to assure the proper handling and movement of livestock.

Shrink of market livestock again is closely correlated with bruises, cripples, and deads, and often occurs from the same causes. Excessive dehydration of animals can be reduced by normal attention to the requirements of the journey. Overfilling before loading causes excessive shrinkage. Pneumonia and shipping fever, as well as weakening conditions due to other diseases and faulty nutrition, cause this situation. Proper preparation before loading for market will assure good condition of animals upon arrival at the market.

Under the heading of disease are losses due to the presence of disease and the weaknesses they cause. One of the serious losses is shipping fever. The chief difficulty in this connection is getting the shipper to take the necessary preventive measures before the animals are shipped. New research in this field promises to cut this toll considerably when, and if, it is finally proved. This research attacks the trouble from the nutrition standpoint in addition to the normally prescribed sulfas and antibiotics. But, to be effective, it should be started before shipping in order to maintain the animal's resistance, and it should be continued on arrival. These things are all related apparently to the viruses that cause a high percentage of the condemnations by the Meat Inspection Branch of the U. S. Department of Agriculture. One feeder reported in the American National Cattlemen's Survey that shipping fever had cost him \$5 to \$10 per steer fed for the last 20 years. This cattleman feeds out 10 carloads a year.

Parasites, normally not thought of as a marketing loss, certainly contribute to reduced returns from animals being marketed. Market men should be interested in the high losses revealed in condemnation of parts, especially livers and other organs, when animals are slaughtered. In several cases, especially in the South, it is often cheaper to ship in slaughtered cattle and hogs from a distance than to take local animals with their attendant condemnations.

Economic loss, as I pointed out earlier, manifests itself in various ways. The vesicular exanthema inspections required cost \$5 to \$10 per car on hogs shipped into quarantine areas. Examination for brucellosis vaccination tags and certificates not only costs money but often delays clearance for shipping, thereby compounding other loss factors. Special restriction on hogs fed raw garbage limits market outlets. Special requirements for disinfection of trucks, yards, rail cars, and other areas are also costly. Marketing specialists can use their influence to a considerable degree with control officials and their departments to keep regulations practical, uniform, and effective.

Because of diseases such as hog cholera and vesicular exanthema, the American swine industry suffers loss of export markets for U. S. pork--this in a period when we should be looking for all possible outlets for agricultural products.

The cost of condemnations is certainly another marketing problem. Who pays? It is certainly not the packer, when the cost of bruises alone or condemnations alone will exceed his profits. The effect on product quality is also pronounced. A hide full of grub holes or damaged by lice, ticks and mange or scratches limits return to the producer. For instance, a hide is 6-1/2 to 7 percent of the weight of a cow or steer. A loin disfigured with a bruise or grub trim has to be degraded several cents a pound. The loss on a bruised ham is about \$2. The quantity of meat lost is insignificant compared to devaluation of the product from retail cuts. Such marketing losses bear concern and corrective activity to increase the return to all segments of the livestock and meat industry.

As mentioned previously, many losses of livestock due to injuries are man-made due to mishandling and poor equipment, not only on the farm but in the feed lot, in sorting and loading, on the road to market, in the overcrowding of livestock in movement, and in the lack of partitions. At the processing plant also, care must be used in unloading and sorting, and hold pens and ramps should be in good condition. Floors and knocking boxes should be of proper construction to prevent all possible bruises. The responsibility for the careful handling of livestock is the responsibility of many, from the farm and ranch to the slaughter floor.

What man has caused, man can correct or prevent. The problem is twofold. First, one cannot correct a problem unless its existence is known. Therefore, it is necessary to find out what the losses are and what causes them. Then, each one must do his part in organizing to correct the situation. Second, an evaluation must be made to provide profit motive as an incentive to effect remedial action. Human inertia must be overcome. People must be encouraged to give priority to the more important things that will often return more profit or income.

Livestock conservation requires the assistance, cooperation, and support of many, all working as a part of a team. Livestock Conservation, Inc., needs the support of market men in working on livestock conservation matters with appropriate agencies in the States, and that agency is ready and willing to aid you in every possible way. Work is well under way among stockyards and exchange groups. The packing industry has formed committees within its respective organizations to assure that each will do its part. Thus, there remains the challenge of bringing a general awareness of the need for careful handling of livestock to the producers, who, as part of the livestock and meat industry, will benefit. The marketing service people represented here are in a position to perform a great service to all in this field of marketing.

A LIVESTOCK CONSERVATION PROGRAM IN MARYLAND

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How and when the program started. A livestock conservation program is not new in Maryland. Members of the departments of markets and animal husbandry have talked about livestock conservation and pointed out the tremendous losses to producers for quite some time. However, in March of 1950 the late Professor Malcolm H. Kerr, department of animal husbandry, and I discussed in detail the subject of dead, crippled, and bruised livestock arriving at packing plants. During this discussion, we decided to do something about this tremendous loss of meat, which, if converted into dollars, represents a staggering figure. Our first effort was a publication entitled "Marketing Tips for Swine Producers." This publication was distributed to county agricultural agents, who in turn distributed it to farmers, 4-H Club members and teachers of vocational agriculture. An illustration to show how effective an item such as this publication may be is the following:

A member of the research staff of the University of Maryland stopped at the farm of a Maryland farmer to discuss a breeding problem. The farmer, his son, and the researcher walked out to the swine barn to look at several of the brood sows. One of the sows was lying down. The researcher raised his foot to kick the sow, and at that moment the son said. "Dr. _____, you evidently did not read the material written by the university people. Somebody at the university wrote a booklet, and they stated that kicking animals causes bruising." I might well add that the researcher commented that he was highly impressed by the serious attitude of this young prospective farmer.

Program accelerated in 1951. The spark that was needed in the livestock conservation program was received during the 1951 Annual Interregional Production and Marketing Conference held at Luray, Va. At that meeting, Dr. J. R. Pickard, who was at that time general manager of Livestock Conservation, Inc., presented an outstanding set of 2 by 2 slides on livestock conservation. These slides are effective, as they show:

1. The causes of bruised, crippled, and dead animals.
2. Dollar losses caused by cutting out the bruised area and also the degrading loss of the carcass.
3. Methods of eliminating these losses.
4. Types of loading facilities.

After having the opportunity to see this set of 36 slides, Professor Kerr and I decided to add them to our program, providing, of course, Dr. Pickard would loan a set for an indefinite length of time. This was accomplished, and these slides have been shown throughout Maryland since 1951. Several slides have been replaced, and several have been added. The slides, along with a talk, are presented at 4-H Club meetings, vocational agriculture and Veteran-on-the-farm classes, farm groups, and Rotary Clubs. They also have been presented at public events such as the Maryland State fair, the Eastern National Livestock Show, and the annual meeting of the Maryland Stockmen's Association.

Exhibit at the Maryland State fair. At the Maryland State fair, the slides were presented to the public in an automatic rotary projector that will hold 48 slides. For this showing, 23 of the slides were used. Preceding each picture slide was a word slide describing the picture to follow. This made a total of 46 slides. The remaining two slides were used to present the title of the series and the cooperating agencies. The slides bearing the word messages were made by placing white letters on a blue background.

This automatic rotary projector was housed in a cabinet equipped so that the slides could be projected on a frosted glass screen. The projector was a part of an exhibit in the beef cattle barns, which included a refrigerated showcase displaying wholesale cuts of beef, pork, and lamb, showing bruises caused by the following:

1. Beating animals with canes, clubs, or other heavy items.
2. Punctures caused by nails, bolts, etc.
3. Goring with horns.
4. Narrow openings, overloading, and trampling.
5. Grabbing sheep and lambs by the wool and lifting to load or unload.

Although this exhibit represented a great deal of planning, it was considered to be worth the time, effort, and cost. This colorful exhibit, along with the bright lights, commanded considerable attention. The color scheme and lighting added what is often referred to as an "attention-getter."

To hold the "customer," it is necessary to have a message which will hold his interest until the entire story has touched his heart or, perhaps one should say, until it has registered. The aim should be to make livestock conservation a part of each farmer so that he will include it in his program of livestock production and marketing.

Program at Eastern National Livestock Show. During the latter part of September 1951, the idea of presenting a program on livestock conservation at the 1951 Eastern National Livestock Show, to be held during the middle of November, was conceived, and plans were developed immediately. The program consisted of brief comments relative to the importance of livestock conservation, presented by a member of the department of markets; a 30-minute illustrated talk on livestock loss prevention, presented by Dr. Pickard; showing of a film, "Clear Tracks Ahead," which depicted railroading and its huge task of moving livestock and other agricultural commodities from one area to another; and the presenting of a canvas slapper by Lewis P. East, manager, agricultural development of the Pennsylvania Railroad. The canvas slapper was given as a door prize at each presentation of the program. The entire program, consisting of 11 presentations in 5 days, was presented in a railway passenger coach located alongside the loading docks adjacent to the beef cattle barns. Entrance to the coach was easily accessible, as the loading docks were flush with the entrance to the coach; therefore, people could walk from the docks directly into the coach car.

More than half of those in attendance were 4-H Club members and students of vocational agriculture. The remainder included farmers, herdsmen, stockyard officials, packer representatives, teachers of vocational agriculture, county agents, and extension specialists. The following 14 States were represented in the total attendance of over 500: Virginia, West Virginia, Pennsylvania, New York, Connecticut, Maine, New Jersey, North Carolina, Ohio, Indiana, Kentucky, Alabama, Mississippi, and California. The District of Columbia and Greece also were represented.

Similar exhibits were on display at the 1952, 1953, 1954, and 1955 Maryland State fair and Eastern National Livestock Show. The exhibit at the 1953 Eastern National was constructed in a railroad caboose. This was an added attraction because many people had never been in a caboose. At the same time, it afforded an opportunity to talk about livestock conservation and show why it is important.

Heel fly control. The departments of animal husbandry, dairy, and markets and the Maryland livestock sanitary service have been cooperating with the department of entomology in conducting demonstrations in controlling the heel fly. Illustrated talks have been given throughout the State. A visual aid that presents the story of the life cycle of the heel fly also is used. This is a 30 by 30 colored chart which can be moved with ease and set up rapidly. It has proved to be very effective. The year 1952 was the pilot year for the heel fly program.

Summary. Farmers spend a great deal of time and effort to select animals for breeding and feeding, and they spend equally as much time and effort to feed and care properly for these animals. Then, when the animal is ready for the market, the farmer gets in a hurry. Consequently, the job of sorting, loading, and unloading is rushed. This means that the animals are clubbed and kicked, and many times gates are slammed against their bodies. The result is a bruised, crippled, or dead animal upon arrival at the packing plant. It is within our ability to help to reduce this tremendous loss of meat, which means more dollars to our farmers.

I would like to close by saying, "Let us all help." A few words now and then about livestock conservation will pay dividends. The spreading of the gospel that livestock is "fragile" and should be handled with care is as important as any problem of production. A very good source of assistance and advice is the organization Livestock Conservation, Inc. Yours for a "Bruise-Free Livestock Industry."

(This talk was followed by a presentation of thirty-four 2 by 2 slides illustrating the importance of a livestock conservation program.)

CONCLUSIONS AND RECOMMENDATIONS ON
REDUCING COSTS OF MARKETING LIVESTOCK AND MEATS BY
PREVENTING LOSSES AND DETERIORATION

The problem before the work group was to arrive at ways of reducing costs of marketing livestock and meats by eliminating losses and deterioration. It was definitely established that these losses and deterioration were a result of (1) bruising, (2) deaths, (3) crippling, and (4) excessive shrinkage in transit. Such losses and deterioration occur along the entire line of transportation from the producer to the packer. As a result of the discussion, it was agreed that they were all "man-made" in the sense of being due to mishandling. Responsible for such mishandling were, in varying degrees, producers, truckers, handlers, and the packers themselves.

It was the consensus of the work group that causes of such losses and deterioration were:

1. Indiscriminate use of electric prods, canes, whips, and clubs.
2. Narrow loading chutes and truck gates with protruding boards, bolts, and nails.
3. Slippery chutes, truck floors, and yards.
4. Improper ventilation and subjection to extreme temperatures, especially heat, during transit.
5. Mixed unpartitioned loads in transit.

6. Overloading.
7. Excessive hurrying of animals while being sorted and loaded at the farm, causing animals to pile up, crowd, and collide with one another and with barriers and truck ends.
8. Improper feeding before transporting, the producer especially being guilty.
9. Excessive speed and stopping for long intervals enroute to market.

The overall solution, it was obvious to the work group, was to eliminate these causes through:

1. Elimination of use of canes, sticks, and clubs, and substitution of slappers and a more judicious use of electric prods and similar nonbruising physical controls.
2. Wider chutes and truck gates with smoother corners and walls.
3. Use of nonskid floors on chutes, in trucks, and in confining pens.
4. Use of closed draft-free trucks during extreme cold, and use of water sprays and adequate ventilation during extreme heat.
5. Use of partitions in hauling mixed or partial loads.
6. Rules and regulations on number and weight of animals and, in the case of trucks, limits on bed size.
7. Patience in handling livestock along the entire line from the producer to, and including, the packer.

It was agreed that the policy of "easy does it" is actually the first and most important principle in the handling of livestock during marketing.

It was concluded that State marketing service agencies can help in the following ways to promote and secure adoption of improved methods of handling livestock:

1. By aiding in developing a coordinated, industry-wide approach to the problem of preventing handling losses in the livestock marketing process. This method should include working with groups or associations of producers, truckers, railroads, auctions, terminal markets, buying stations, sales agencies, packers, and extension and other educational groups.

2. By working with a joint committee representing all groups in developing specific recommendations or rules regarding ways and means that could be adopted by various groups to reduce livestock handling losses.
3. By working with leaders in the educational and informational fields in adapting to local and State situations livestock loss prevention information and educational material such as that produced by Livestock Conservation, Inc. This program could be adapted to the local level by encouraging and assisting State vocational leaders in developing reference materials as adjuncts to a youth educational program and for use in radio, television, and newspapers.

REDUCING COSTS OF MARKETING LIVESTOCK BY
IMPROVING HANDLING METHODS, EQUIPMENT, AND FACILITIES

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The results of research work on livestock terminal yards and auction markets show that marketing costs can be reduced by the use of improved methods and facilities. Since our research work on auction markets is further advanced than that on terminal yards, this discussion will be confined primarily to auctions. Handling methods, equipment, and facilities on livestock auctions are so closely related that it would be difficult to consider them separately. Therefore, this discussion will be devoted to all three phases of these auctions.

The use of improved methods and facilities on auctions can reduce the amount of labor required to operate the market on sales days. Other benefits possible from properly designed and arranged facilities are a reduction in losses from shrinkage, bruises, injuries, and deaths. The savings from these items probably would be as great, if not greater, than those derived from operation with smaller crews. Improved facilities also should: (1) Provide sanitary conditions and assist in preventing the spread of livestock diseases, (2) reduce the amount of time sellers' trucks spend waiting to unload, (3) increase the rate at which buyers' trucks can be loaded, (4) assure an uninterrupted flow of livestock into the sales rings, and (5) minimize facility construction and maintenance costs.

The livestock auction market comprises several component parts, such as truck docks, including the platform, chute, chute pens, and loading pens; catch pens; tagging chute; alleys; holding pens; facilities for driving livestock into the sales ring; scale and scale platform; catwalks, and the sales barn. Each part must be properly designed and properly arranged. The market site must be adequate in size to provide a free flow of traffic to and from the market and have a parking area for the vehicles of market patrons.

Truck docks, with platforms of truck-bed height and of adequate width, are mandatory for efficiently unloading and loading livestock. Two and three level fixed-height truck docks usually are suggested. Animals move up and down the step-type chute with less hesitation than over the ramp-type so often used. Well-designed chutes have gates of proper width which are easily affixed to trucks for prompt unloading. Chute pens of proper size to hold lots of animals temporarily after unloading are essential to equalize the work load. Truck docks should be located so that livestock travel the shortest distance possible in going to and from holding pens in the yards.

Catch pens are mandatory at various locations in the yards to break the sequence of the physical handling operations and permit their performance at different rates. Catch pens also permit the performance of certain operations with less effort, and in some instances reduce the total labor requirements.

To function efficiently, livestock auctions should have a sufficient number of alleys of proper width to permit a free flow of all kinds of livestock to and from each part of the market, and to permit the use of mechanized equipment for cleaning. In some instances, the number of alleys has been reduced to minimize roof cost. As a result, operating costs usually are increased.

Auctions that tag cattle in most cases are of the "single" chute type which usually permits only one owner's lot to be driven into it at a time. A "double" chute, or a chute which consists of two parallel chutes separated by a working platform, provides for greater operating efficiency because it is more conducive to continuous operations. Workers can receive one owner's lot in one side, while another owner's lot is driven into the other side. Again the "double" tagging chute usually fits better into the market layout because of its shorter length.

The number, size, and type of holding pens needed on auctions are directly related to or are dependent on such factors as: (1) Volume of business handled per sale, (2) species handled, (3) average weights by species of animals handled, (4) penning practices employed, and (5) number of buyers and range in volume purchased. Holding pens designed to permit livestock to enter from one alley and leave by another give the greatest operating efficiency. Properly designed and constructed fences and gates can minimize construction costs and reduce the amount of capital investment needed. Excessive fence and gate construction is high on some markets.

Properly designed and arranged facilities for holding livestock near the sales ring and for driving livestock into the sales ring are essential, if delays in the sale are to be minimized and animals driven into the ring with the smallest work crews. The kind and type of facilities required vary for the species of livestock sold, the temperament of the livestock, and the area in which the market is located. Frequently, well-designed pens of different sizes, properly arranged, will suffice. Again, the feeder chute or a multiple-lane chute might be needed for maximum efficiency, particularly for a market in an area where range cattle are common, and where a fast sale of single animals and small lots is desirable.

The improper location of the scale platform easily can add one or more workers to the scale crew, or the crew yarding the livestock. Furthermore, the scale platform should be of the proper size to handle efficiently the drafts of single animals and small lots which characterize weighing in many auctions.

"Catwalks" over the market yards provide buyers, sellers, spectators, and other people a means of inspecting livestock without walking through alleys and climbing fences. Catwalks enable market workers to perform the physical handling operations with less interference.

The auction sales barn and the operations performed in it are appraised by more market patrons than any other part of the market. Therefore, barns should permit operating efficiencies and provide conveniences for buyers, sellers, and spectators in line with modern-day business practices. Some principles to be observed are:

1. Design a barn that requires minimum construction and maintenance costs. Most barns are used for sales only one day each week. The use for other purposes is limited.
2. Design barns that provide for a free flow of pedestrian traffic into, through, and out of the facility, and that meet the requirements of local ordinances. As buyers, sellers, and spectators constantly go into and out of the barn during the sale, adequate entrances and exits are essential.
3. Provide accommodations in barns for an audience of fluctuating size. As the number of people attending sales often changes, it is impractical to provide seats for peak audiences. It is more practical to provide some seats and a balcony where people can stand and view the sales ring.
4. Arrange seats so buyers, sellers, and spectators have an unobstructed view of the sales ring and auctioneer's box.
5. Design a sales ring that permits a free flow of livestock into, through, and out of it with a minimum of labor.
6. Locate market offices where they are easily accessible to buyers and sellers and will facilitate the exchange of records with the auctioneer's box.

Most of the facilities discussed are common to most markets; however, their arrangement in the market proper will differ with different marketing practices. For illustration, the arrangement of facilities on a market that weighs livestock after their sale would differ considerably from the arrangement on markets that weigh livestock on arrival. Again, markets that do not tag cattle would not need a tagging chute. Poorly arranged facilities might result in cross flows of traffic, necessitate relatively long drives of animals between work stations, increase the amount of labor required, and retard the rate of sale. The market must be efficiently designed and properly arranged to assure maximum benefits to its operator and to the sellers and buyers.

REDUCING COSTS OF MARKETING MEAT BY IMPROVED HANDLING METHODS AND EQUIPMENT

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About 250,000 retail grocery stores in the United States are selling meat. Thousands of these stores have either complete or partial self-service meat departments. The number of stores selling meat by self-service has been increasing. With the rapid adoption of this new method of merchandising, new problems are confronting store operators. Many of them are using makeshift methods, procedures, and equipment to prepare their meats for sale through the self-service display case.

The largest single item of expense in retail food stores is the cost of labor. The self-service meat departments in stores studied required about 25 percent of the total labor hours in the store. Studies were made of all major functions in service and self-service retail meat markets for the purpose of finding ways to increase the productivity of labor and reduce packaging material costs through improved methods, materials, equipment, and layout. Any reduction in the cost of handling meat at retail not only should benefit the retailer but, through lower retail prices and increased volume, also should benefit the consumer and the farmer. Individual employees also should benefit through increased wages for greater productivity.

The methods and equipment used in a number of stores of several different food store chains in various parts of the country were examined before detailed studies were made. Close examinations of the operations in 52 stores of 3 companies in the southeastern part of the country were made, and 26 stores were selected for detailed studies. Over 140 store installations of improved methods were made and evaluated before the final report on layout principles was written.

(Films showing results of the studies on the improved handling of meat in self-service stores were shown. The results were extracted from the following published reports:

- (1. Receiving, Blocking and Cutting Meats in Retail Food Stores.
Marketing Research Report No. 41, AMS, USDA.
- (2. Packaging and Displaying Meats in Self-Service Meat Markets.
Marketing Research Report No. 44, AMS, USDA.
- (3. Principles of Layout for Self-Service Meat Departments.
Marketing Research Report No. 77, AMS, USDA.

REDUCING COSTS OF MARKETING LIVESTOCK BY
IMPROVING LIVESTOCK MARKET FACILITIES

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To set the proper background for this discussion, everyone here should understand that the Producers Marketing Association is a farmer-owned and -controlled cooperative marketing association. Therefore, it goes about its business of expansion and operation with a policy of service and benefits to the livestock producer, rather than on a strictly profit basis. In other words, if this service or facility can do a better job of marketing farmers' livestock and enhance the farmers' net income, then it is worthwhile. So today, I want to share with you some of our ideas and convictions in locating and operating livestock markets, that were gained mostly from our experiences over the last 10 years. First, I shall deal with the conditions in locating markets and then with the facilities in the markets.

In locating a market, the one essential which must be determined is the real need of the farmer. This is answered by a study of prices farmers in the area are actually receiving for livestock. If it shows that competitive pricing needs to be introduced into the area, then a study of the available volume needs to be made. In such a study, a radius of about 20 miles around a certain location is taken to determine the potential on hogs, and a radius of 30 to 40 miles on cattle. This based on the experience that, under present marketing practices, hogs and cattle will not move in volume to a local market much farther than these distances.

In our organization, since we are a farmer-owned cooperative marketing association, the next determination is whether or not farmers in the area are willing to finance the purchase or construction of facilities necessary for a market. If all three of these determinations are in the affirmative, we proceed to locate a market in that area.

In locating a specific spot for a market, two very important points must be considered: (1) What railroad is available, and what kind of service for outbound shipments of slaughter livestock and inbound shipments of feeder livestock does it have? (2) Is it easily accessible by good roads and highways? Another point, although not a determining one, is whether or not it is near a shopping or trading center.

From the information obtained in the above-mentioned studies, a determination is made as to whether it will be a daily market for hogs and lambs only or a complete market, including auctions. Following this step, the work on planning facilities is started. If it is to be an auction and daily market for all types of livestock, a different type of facility is needed than would be used for a daily market for hogs and lambs. Our setup provides for four different types of construction: Frame, cement block, steel, and pole. If the Producers Marketing Association were building another market today, it would be pole. There are two types of roofs: Builtup and aluminum. All our later roofs are aluminum and so will all our future ones be. The difference in the temperature on the inside is worth any increased costs.

One big consideration that must be made in planning a facility is that as much cross traffic as possible be eliminated. Livestock must flow into, through, and out the market without criss-crossing, in order to have an efficient operation. Livestock flows through a market like a slow liquid, and the more turns there are, the more trouble there will be.

Cement floors are used throughout our construction, with drainage troughs running the full width of the yards, spaced approximately 50 feet apart. These are bridged over with perforated steel plates, which provide for easy cleaning. On the outside of the building are basins to catch the drainage and all the heavy sediment. From the catch basins, tiles are run to adequate drainage.

On the livestock markets, sales start promptly at 1 p.m. Any livestock arriving after that time must wait until all other livestock is sold before it is permitted to go through the auction. Consequently, little livestock arrives after the 1 p.m. deadline.

(Slides were shown to point out some ways of eliminating congestion and speeding up the operations of both a daily market and an auction, and to show methods of eliminating cross traffic and keeping corners to a minimum. A drawing of the floor plans of the Terre Haute market showed, by means of arrows, the flow of livestock in the receiving operation as well as in the movement through the auction.)

REDUCING COSTS OF MARKETING LIVESTOCK AND MEATS
BY IMPROVING FACILITIES

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The livestock and meat industry is deserving of the great interest that has been manifested in it at these workshop meetings. A few statistics may show clearly the importance of this industry. For instance, during 1955 livestock sales amounted to 6.7 billion dollars and accounted for 28 percent of all farm income. The 1955 livestock and meat marketing bill totaled 6.4 billion dollars.

Your interest in this problem is justified on still another basis. The market structure for, and the facilities used by, this industry are being altered by some very fundamental changes, such as improvements in highways and truck transportation; greater dissemination of market news; better understanding of market news and livestock and meat grading; decentralization of livestock slaughtering; and recent and prospective changes in meat wholesaling, handling, packaging, and retailing techniques. All of these things are having, or will have, a profound effect on the efficiency and effectiveness of our livestock and meat marketing process.

My assignment here today is one of pointing up for your consideration some of the major problems in livestock and meat marketing in which facilities are a factor in efficiency. To simplify the presentation, I should like to divide it into four broad functions or operating sequences in the marketing process. These are:

1. The marketing of livestock, which includes transportation through to the slaughterer. The facilities for this function might be further divided into auctions, local and terminal yards, and the buying stations used by packers and independent dealers.
2. The slaughtering and processing function, normally termed meatpacking. Slaughtering plants are classified by the U. S. Department of Agriculture into three groups, namely: Federally inspected, wholesale, and local slaughterers. It should be noted that meat processing also is being done by both wholesalers and retailers.
3. The wholesaling function, which might be divided into three classes, namely: Packer branch house, independent wholesale, and chainstore operations.
4. The retailing function, which may be divided into self-service and butcher-service stores.

To bring these four main functions into proper focus, the total meat marketing bill for 1955 is broken down accordingly. This breakdown is based on the 1947 marketing margins study of the Agricultural Marketing Service. Although it may not be absolutely accurate for 1955, it does permit a more specific basis for pointing up the importance of each operation.

Table 5.--The livestock and meat marketing bill, by marketing function, 1955.

| Marketing function | Total bill for 1955 | Division of dollar <u>1/</u> |
|--------------------------------|------------------------|------------------------------|
| | <u>Million dollars</u> | <u>Cents</u> |
| Livestock marketing. | 407 | 6.4 |
| Slaughtering and processing. . | 2,362 | 37.1 |
| Wholesaling. | 739 | 11.6 |
| Retailing. | 2,859 | 44.9 |
| Total. | 2/ 6,367 | 100.0 |

1/ Basis: "Farm and Retail Margins for Livestock and Meat," Bureau of Agricultural Economics, U. S. Department of Agriculture, June 1949, pp. 3-4.

2/ Based on total marketing margin of 25 cents per pound, and on total commercial slaughter of 25,471,000,000 pounds in 1955. Source: Market Organization and Costs Branch, Agricultural Marketing Service, U. S. Department of Agriculture.

In our approach to the problem of reducing costs, it must be recognized that changes or improvements in this livestock and meat industry are slow. There is a good reason for this slowness. Aside from the fact that the industry has been steeped in tradition and fixed points of view, it is loaded with heavy fixed investments in specialized equipment and facilities--slaughtering and processing buildings that have no alternative uses; heavy refrigeration and much insulated floor space for cooling, holding, and curing meats that cost more than the building itself; special refrigerated railroad cars that are expensive to replace; and retail stores which must be abandoned for locations which will permit larger units with a larger meat display case capacity and the necessarily larger parking lot. All of these things slow down the changes which are essential if labor costs are to be reduced and efficiency increased.

Livestock Marketing

Although the livestock marketing phase of the meat marketing process is the smallest cost item, being only 6.4 percent of the total livestock and meat marketing bill, it looms large in our work with farmers. It is at this point that more than 4 million livestock producers find out what consumers want and how much they want it.

Livestock marketing has been undergoing a slow but definite change during the past 30 years. Terminal market facilities, which were once the heart of the pricing system, are gradually declining in importance. To illustrate, salable receipts on the Chicago market dropped from 6.5 percent of total U. S. slaughter in 1939 to 2.9 percent in 1955. Where is this livestock being marketed now? Most of it is going through packer or independent buying stations and the livestock auctions. During the same period, 1939-1955, the number of livestock auctions increased from about 1,400 to 2,300. How well are these local auction facilities serving the livestock producer? In many areas, the answer to this question would have to be a negative one.

In many, although not all, States there are too many auctions with too little volume for the economical use of competent auction management as well as buyer time and talents. Such unhealthy competition and duplication of market facilities inevitably forces some operators into unsound and sometimes unethical practices. The better auction operators are, and should be, concerned about the impact of this type of operation on the auction industry as a whole. State departments of agriculture can do much to bring the leaders in livestock production and marketing together in a program to make these local markets do a more efficient and accurate job of reflecting consumer preferences for grades to producers. It is in these local market outlets for livestock that farmers should find the incentives for improvement or the key to change in the type of hog or beef animal they are breeding and feeding.

One might go so far as to say that in the work with the livestock segment of the marketing process, the emphasis should be on effectiveness as much as, or more than, on lower costs. In my estimation, we must take full advantage of the educational potential in the local livestock market pricing system if we are to get the kind of changes needed in hog and cattle production. Too frequently the facilities and the methods used in selling livestock have completely obscured this valuable tool of the free market system. Let me cite an example. The facilities used by many hog buyers are no different than they were 30 years ago when hogs were being handled through the railroad holding pens in the country towns. The facilities for sorting are not much improved over those used when I worked as a member of the staff of a packer buying station in 1932. Then, the only sorting done other than on a weight basis was to pick out the stags, piggy sows, and cripples. Hog and pork marketing must be improved if pork is to hold its own in the battle for the consumer's dollar.

May I digress here to say that progress in the production and marketing of meat-type hogs is slow for several reasons. Farmers like premiums for meaty hogs but not discounts for the chuffy kind. Many hog buyers would rather avoid the arguments with producers by buying hogs without sorting. Many buyers say it is time-consuming and impractical to sort hogs on a quality basis. Packers say they do not get enough meat-type hogs to justify sorting the carcasses and cuts for special pricing in the wholesale market. Retailers say they cannot differentiate between meaty and fat cuts at the retail counter until such time as they can be assured of an adequate and constant volume of cuts from the better grade. All of these arguments and limitations must be recognized if any work is to be done on this problem. All segments of the marketing process must work together if any progress is to be made. You can make a vital contribution by helping to get this coordination and cooperation.

Local livestock market facilities of adequate size or capacity, properly designed and located, can be a factor in the hog market improvement program. Well-designed and well-located sorting gates and alleys, as well as scales, are essential to the efficient use of labor in this difficult sorting process. The facilities also are a factor in the elimination of excessive bruising. In an auction market, volume is essential if the market is to attract buyers for those odd lots of off-grade animals that accumulate as a result of the grading process. The proper size or capacity and location of the auction facility, therefore, is very important to any market improvement program.

Slaughtering and Processing

The estimated cost of slaughtering and processing the Nation's meat supply during 1955 amounted to \$2,362,000,000 or 37.1 percent of the total livestock and meat marketing bill.

The U. S. Department of Agriculture reports indicate that a total of 3,217 plants slaughtered more than 300,000 pounds of live animals annually. The following data on the numbers in each slaughter group for 1950 and 1955 show a marked increase in the number of plants in the wholesale group.

Table 6.--A comparison of the number of slaughtering plants in the United States, 1950 and 1955.

| Type of Plant | 1950 | 1955 |
|--|---------------|---------------|
| | <u>Number</u> | <u>Number</u> |
| Federally inspected | <u>411</u> | <u>455</u> |
| Wholesale (handling over 2 million lbs. live weight). . | 725 | 952 |
| Local (handling over 300,000 lbs. but under 2 million lbs. live weight). | <u>2,072</u> | <u>1,810</u> |
| Total. | 3,238 | 3,217 |

Thus, during this 5-year period 14 federally inspected and 227 wholesale slaughtering establishments have been added. Observations indicate that these increases are a result of wholesale slaughtering plants shifting into Federal inspection and local slaughterers expanding to the point where they are classed with larger wholesale slaughterers. The following table shows the number of wholesale slaughtering plants by regions.

Table 7.--Number of wholesale slaughtering plants in the United States, by region, 1950 and 1955 1/

| Region | Number of plants | | Increase in number of plants | |
|-----------------------|------------------|---------------|------------------------------|----------------|
| | 1950 | 1955 | | |
| | <u>Number</u> | <u>Number</u> | <u>Number</u> | <u>Percent</u> |
| North Atlantic. . . . | 108 | 151 | 43 | 40 |
| East North Central. . | 213 | 258 | 45 | 21 |
| West North Central. . | 51 | 69 | 18 | 35 |
| Southeast | 82 | 144 | 62 | 76 |
| South Central | 142 | 186 | 44 | 31 |
| West. | 129 | 144 | 15 | 12 |
| Total | 725 | 952 | 227 | 31 |

1/ Slaughtering more than 2 million pounds of livestock annually but not Federally inspected.

Although the wholesale group expanded by 227 plants, or 31 percent, the local slaughterer classification declined by 262, or 13 percent. No doubt some of the decline in local slaughtering was a result of a weeding-out process among those units opened during or immediately following World War II.

The State departments of agriculture can make a significant contribution by working with those firms which are expanding and planning new facilities in production areas. The data on percentage growth of wholesale facilities indicate that the opportunities for work are greatest in the Southeast and in the North Atlantic States, where there have been increases of 76 and 40 percent, respectively. These production area slaughter facilities no doubt provide additional competition for livestock and, at the same time, call for a new approach to livestock marketing by producers in the area. You can help derive

the maximum efficiency from these expanding plants by helping to evaluate livestock production potentials. Leadership should be encouraged to weigh all the information available before embarking on programs for the expansion of old or the construction of new slaughter facilities. We should help avoid over-expansion or duplication of facilities as well as aid in planning new facilities.

One significant development of recent years which provides striking evidence of the change in the location of slaughtering facilities is the abandonment during the past two years of packing houses in Chicago by two major packers. These closings were a direct result of comparisons of operating costs in terminal versus production-area plants. Iowa slaughter data provide more evidence of decentralization in livestock slaughter. From 1939 to 1954, the slaughter of all livestock in the State increased 53 percent, while the total increase for the United States was only 44 percent.

Meat Wholesaling

The cost of wholesaling meats and other packing house products in 1955 was estimated at 739 million dollars. It was 11.6 percent of the total livestock and meat marketing costs and amounted to about 2.9 cents per pound of product.

Fundamental changes in this function have been taking place for many years. Since the advent of the national and local chainstores, these groups, in many instances, have built their own wholesale warehouses for meats. This is particularly true for operations in and around metropolitan areas. A second development which has affected wholesaling is the long-distance truck haul. More recently, we have witnessed the development of special refrigerated truck bodies that are carried on railroad flat cars and then placed on truck beds for direct delivery to retail outlets. All of these changes are designed to reduce the cost of wholesaling meats.

As pointed out earlier, changes in this field are slow. Heavy investments in branch house facilities cause the industry to move cautiously in making shifts. In a recent survey of one wholesale market, it was found that warehouse labor costs in packer branch houses were 28 cents per 100 pounds above normal costs in modern one-floor facilities. If this situation were typical for only 10 percent of the estimated 25,471,000,000 pounds of meat derived from commercial slaughter during 1955, the total excess cost would amount to more than 7 million dollars annually.

Several factors, however, complicate the analysis for those who are planning the future wholesale meat facility. Some of the more important questions to be answered are:

1. Will more chainstore groups add meat wholesaling as one of their functions? In a recent panel discussion at the annual convention of the American Meat Institute, prominent representatives of the chainstore groups predicted some further expansion of meat wholesaling within their groups.
2. Will pretrimmed, precut, and prepackaged frozen meats change the type of facility needed? If so, how soon will prepackaging and freezing at the packing plant become a major operation?
3. Will processing at the wholesale level become more or less important during the years ahead?
4. To what extent might antibiotics and irradiation be used in meat preservation, and what effect might these innovations have on the type or use of wholesaling facilities?
5. How will future changes in highways and transportation affect wholesale trade territories?

To do our job for the livestock and meat industry, it seems essential that we help local leaders analyze and evaluate these trends when they are making plans for more modern and efficient meat wholesaling. In those areas in which wholesale facilities are obviously antiquated and expensive to operate and in which similar types of operation in modern facilities are likely to continue to serve the retail trade, we should stand ready to help collect and analyze the facts necessary for sound recommendations to the local leaders and market planning groups.

Retailing Facilities

Retailing is by far the largest cost item in moving livestock and meats to consumers. Assuming that the retailing cost in 1955 took the same proportionate share of total marketing costs as it did in 1949--that is, 45 percent--the total bill for this service would amount to about 3 billion dollars, or slightly more than 11 cents per pound. Previous speakers have discussed many ways by which meat retailing has been, or will be, improved. Certainly, the present-day prepackaged self-service method of merchandising has been an improvement. No doubt it has been one of the factors that has minimized the increase in retailing costs resulting from higher wages. In addition, self-service has permitted the growth in the size of stores. Recent data from the National Association of Food Chains indicate that during the period 1947 to 1955, meat sales per store member in that organization increased from \$50,000 to \$150,000 annually. With an increasing percentage of sales going through these larger retail stores, it may be assumed that, other things being equal, meat retailing costs will decline.

In closing, I should like to suggest some areas for emphasis in your work on facilities with the livestock and meat industry. There is a vital need for more coordination, cooperation, and understanding among producers, market groups, slaughterers, processors, wholesalers, and retailers. The lessons in consumer preference learned at the self-service meat counter must be more widely and accurately reflected in the livestock pricing system if meat producers are to get the most out of the consumer's disposable dollar. We must encourage consumer preference research and its interpretation. Retailers should be brought into the program to help plan improvements.

If the market system is to afford the talent and the modern facilities which will enable it to do an efficient as well as a low-cost job, we must help maintain a proper balance between size for efficiency and numbers for competition and convenience.

Leaders among livestock producers and others must be informed on marketing problems. They must be made aware of problem areas. They must be brought into your program planning. They should be a part of the decision-making process. With intelligent and understanding advisory groups, the facility planning program can be made an effective tool for getting increased efficiency into the livestock and meat marketing process.

CONCLUSIONS AND RECOMMENDATIONS ON REDUCING COSTS OF MARKETING LIVESTOCK AND MEATS BY IMPROVING HANDLING METHODS, EQUIPMENT, AND FACILITIES

(Note: The close interrelationship among the handling methods, equipment, and facilities used in the livestock and meat marketing process made it desirable to report jointly the conclusions and recommendations of the two work groups handling these topics.)

The discussion of reducing costs of marketing livestock through improved handling methods and equipment and distribution facilities included four aspects of the market. These were livestock marketing, meat processing, wholesaling, and retailing.

Livestock market facilities

The discussion of livestock market operations centered on auctions. The major emphasis was on high costs that were attributed to inadequate volume. The inadequate volume, in turn, was related to the fact that there are too many auctions in some areas and to the lack of preconstruction facility planning for efficient use of labor and investment. Major criticisms of the auction equipment and handling methods revolved around the following:

1. Unloading and loading docks and chutes that are too narrow to permit freedom of movement of livestock and manpower as well as easy positioning of trucks.
2. Inadequate parking and unloading areas.
3. Not enough tagging chutes for proper use of tagging manpower and unloading capacity.
4. Slippery chutes and floors which slow livestock movement.
5. Lack of overhead catwalks for inspection of livestock by auction customers, with resulting confusion and delays in the movement of livestock through alleys.
6. Pens without access from both ends.
7. Pens that are too large for small lots.
8. Scales that are not properly located at sales ring, thus requiring extra handling labor to and from ring.
9. Improper location and design of sorting gates.
10. Square sales rings that inhibit buyer viewing and prompt evaluation and movement of livestock.
11. Lack of proper floors and the resultant cleaning problems.

The work groups suggested that consideration be given to the following programs by the State departments of agriculture:

1. Wherever advisory committees are not now in existence, the States should foster well-selected advisory committees on livestock and meat marketing facilities and practices. These committees should have adequate representation from each producer organization in the livestock field, as well as representation from the auction, dealer, market agency, packer, retailer, educational, regulatory, and service groups. They should meet annually or as often as necessary to consider and make recommendations on livestock and meat marketing problems.
2. Where manpower and conditions warrant, surveys of existing auctions and other livestock markets should be conducted to obtain information on volume handled, capacity, facility design, rates, and such other information as might help an industry-wide livestock market advisory committee determine areas which need attention and action on the part of the State departments of agriculture.

3. Where State licensing laws governing sanitation and other features of the livestock auctions and local markets are not on the books, State department workers should obtain the cooperation of an industry-wide committee in fostering the development of a recommended code of operation or rules and regulations, which would help to eliminate waste in this phase of the livestock marketing process.

Meat processing facilities

In some areas, particularly in those areas where there has been marked expansion in livestock production and slaughtering, the State departments of agriculture can help by working with processing groups in guiding expansion and facility planning to make them as efficient as possible.

Analysis of present and potential livestock production, and surveys of marketing and slaughter facilities should be helpful in avoiding poor locations and excess or inadequate slaughter plant capacity.

Meat wholesaling facilities

Where meat wholesale facilities are obsolete and poorly located State departments of agriculture can make a contribution by conducting surveys and studies to aid in determining the most feasible approach to relocating and rebuilding facilities for more efficient marketing of meats.

Meat retailing facilities

In making recommendations regarding work in the retail field, it was agreed that the problem was deserving of more attention than it was getting and that some attention should be given to the problem of determining the area or areas in which the State departments of agriculture, where equipped to do so, can make a contribution. Furthermore, personnel needs should be given consideration. One alternative would be to use personnel of trade organizations. If feasible, some States might wish to consider a training program for personnel employed to work in the retailer educational field.

The problems of reducing the cost of retailing involve a careful appraisal of retail operations and services. Some of the specific areas given consideration were:

1. Prepackaging and self-service as a means of reducing labor costs and improving customer convenience.
2. Increasing amount of meat fabrication at the slaughter and wholesale level.
3. Reducing store labor requirements through improvements in the arrangement of retail store meat receiving areas and more rail blocking and boning.

GENERAL SESSION ON
EXPANDING MARKET OUTLETS FOR AGRICULTURAL PRODUCTS

PROMOTIONAL PROGRAMS FOR AGRICULTURAL PRODUCTS

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Promotion of agricultural products is being conducted continuously by many agencies at all stages from producers to consumers. In this discussion, promotion means all efforts to raise the demand for or increase the consumption of one product or one class or brand of a product, or all food products collectively.

In this discussion, I shall explain the promotional activities, both in routine and emergency situations, of the food retailers of the country. In addition, it will help to sketch briefly and give some examples of the wide variety of promotional activities which are being conducted by other organizations and show how they are related to the promotional activities of the food chains.

One general principle which applies to promotional efforts by all agencies and at all levels is that effective promotion means more than merely talking about a certain product--it means deeds as well as words. In order to be effective and to raise the demand and consumption of a food product, promotion must include some increase in value of the product to the consumer such as:

1. Availability in more seasons of the year.
2. Availability in many different forms, such as fresh, canned, frozen, and dried.
3. Availability in convenience form so that it makes a contribution toward emancipation of the housewife from kitchen labor.
4. Availability in more geographic regions.
5. Improvement in quality, service, or price to consumer.

Retail food distributors--both chain and independents--carry on both routine and emergency promotional activities constantly. Food retailers are promoting agricultural products 52 weeks of the year. They cannot promote all products all the time, so a few are selected each week for special treatment. The "weapons" used by retailers for promotion are store displays, newspaper advertising, wall and window signs, shelf cards, radio and TV advertising, pricing, and the distribution of information to food editors and the press. These activities are all of great importance in moving the maximum volume of agricultural products into consumption.

Food distributors are also promoting all agricultural products collectively through modern developments in retail distribution. One of the most important demand-creating promotional effect self-service has. Nothing is so stimulating to sales of a product as allowing customers to feel, touch, and smell it. Self-service raises total consumption of food and, of course, is the most reliable guide available to true consumer choice. Along with self-service has come improvement in trim, in aging, in sanitation and packaging, and in variety of products carried.

In addition to self-service, the growth in the size of stores (number of supermarkets), growth in number of items carried by stores, and the operation of airconditioned, well-lit stores with parking lots are all designed to make shopping easier or a pleasure and are important as overall promotional devices.

These activities are true promotion in the sense defined earlier, because they make a contribution toward increasing the value of the products to consumers. The evidence for this is the acceptance of these services by consumers and their willingness to raise the proportion of disposable income spent for food.

In previous comments referring to promotions, I have called them "usual" or "ordinary." They are run by each company according to individual company policy. These activities are stimulated by the spur of competition. In addition, NAFC members participate in organized promotional efforts--sometimes in response to a crisis and sometimes for a routine promotion--under the Farmer-Retailer Marketing Program. Most of you have heard of this program. Some of you have received bulletins or announcements from my office which told you of some current development in the operation of the Farmer-Retailer Marketing Program. I want to review for you now some of the principles and methods of operation underlying this program and review its intensive operation over the past year.

The NAFC agricultural program is designed to harness the merchandising and promotional capabilities of our 250 NAFC member companies and their 12,000 supermarkets and stores to move supplies of individual commodities into consumption in order to stabilize farm prices when supplies threaten growers' incomes. Briefly, the way in which the program operates is as follows:

When farmers are faced with an unusually heavy seasonal supply of some commodity, or large supplies unduly threaten growers' incomes, they request NAFC members to lend a hand. The request must come directly from growers or from their organizations. The request is evaluated by the NAFC Agriculture Committee. If the committee approves, the program is presented to the NAFC membership for united action. Our experience in these campaigns has been that the large supplies can be moved into consumption faster and at a better price to farmers than they could have been moved without this promotional effort behind them. As you know, a promotional effort by retailers, if successful, raises consumer demand for the product. When convinced that an item is an unusually "good buy," consumers will shift their taste to consume more of that particular commodity. The records of our member companies show that without a doubt they can influence consumer tastes through special promotion and merchandising.

One year ago at this time we were deeply involved in a series of national retail sales campaigns which tested the Farmer-Retailer Marketing Program as it had never been tested before. You will recall the distressed condition of the hog and beef markets in November, December, and January a year ago (1955-56), as total per capita meat supplies reached the highest figure since 1908. The principal reason for this peak was that 1955 was the first year since 1895 in which the pork and beef production cycles "peaked" at the same time.

The following table shows the trend in per capita consumption of meats in recent years:

Table 8.--Per capita consumption of red meats and poultry.

| | Average 1935-39 | Average 1947-49 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | (Est.) 1956 |
|--------------------|--------------------|--------------------|--------|--------|--------|--------|--------|--------|----------------|
| | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds |
| BEEF | 54.8 | 64.7 | 62.6 | 55.3 | 61.5 | 76.5 | 79.0 | 80.9 | 83.5 |
| VEAL | 8.1 | 9.6 | 7.9 | 6.6 | 7.1 | 9.4 | 9.9 | 9.3 | 9.3 |
| LAMB AND MUTTON | 6.7 | 4.8 | 3.9 | 3.4 | 4.1 | 4.6 | 4.5 | 4.6 | 4.4 |
| PORK ^{1/} | 55.7 | 67.4 | 68.2 | 70.9 | 71.6 | 62.6 | 59.2 | 65.9 | 66.3 |
| CHICKEN | 13.2 | 18.5 | 20.3 | 21.4 | 21.8 | 21.6 | 22.5 | 20.9 | 23.4 |
| TURKEY | 2.1 | 3.2 | 4.0 | 4.4 | 4.6 | 4.7 | 5.2 | 5.0 | 5.4 |
| TOTALS | 140.6 | 168.2 | 166.9 | 162.0 | 170.7 | 179.4 | 180.3 | 186.6 | 192.3 |

^{1/} Excluding lard.

Sources: U.S. Department of Agriculture--Agricultural Statistics, 1955; the Poultry and Egg Situation, July 18, 1956; the National Food Situation, November 2, 1956.

Under the Farmer-Retailer Marketing Program, NAFC members conducted in 15 months of 1955-56 a total of 14 separate, organized, high-intensity sales campaigns for red meats and poultry. This marked the longest sustained period of promotion activity under the Farmer-Retailer Marketing Program since its origin more than 20 years ago. This dramatic red meat and poultry merchandising effort upon the part of chain food companies and other organized retail distributors was almost continuous for two important reasons:

1. When any commodity offers consumers a special value, it is promoted in accordance with the usual good merchandising practices of chain food companies. But added meat volume was a vital necessity for the distributor this past year because of the lower retail price. He had to move more tonnage to cover his costs.
2. But the real significance for livestock products and the entire meat industry was that the series of "producer-consumer campaigns" conducted by the organized food chains was in response to specific requests and justification of need by livestock producers. In these peak merchandising periods, something more than the normal merchandising effort is applied to the commodity. The men who operate these chain food companies make no claims to altruism. They are, however, broad-gage men who recognize that they are part of the entire free enterprise system of the country; that they are an important link in the distribution of food from farm to table under a free enterprise system; they can look beyond the minutiae of daily operating problems. And, perhaps equally important, they want to see the livestock raiser prosper because he is their supplier.

It will not be necessary to go into complete details on the results of these campaigns. They have been documented fully in the little booklet entitled "It Didn't Just Happen." Many of you have already seen it and if you do not have a copy, I will be pleased to send you one.

The results of these campaigns can be summarized as follows:

1. Sales results.

During the campaigns--for the 4 weeks ending March 16, 1955, the period of the first campaign in this series--pork production increased about 20 percent over the same period in 1954. During this campaign, NAFC members increased their tonnage sales of pork by more than 34 percent over the same period in 1954.

2. Consumption results.

- a. Consumer interest in pork, lagging in recent years because of low production, was renewed and will be of continued benefit to producers.
- b. Consumption was stepped up to a rate in excess of current production. The result was that storage stocks of pork on February 29, 1956, were only 86 percent of the 5-year average for this date.

3. Price results.

Live hog prices were supported and kept from falling as fast or as far as they would have in the absence of these campaigns. Shipments of live hogs during the first 10 weeks of the 1955 fall marketing season (August 12-October 15) rose from 900,000 per week to 1,450,000 per week. This was accompanied by a fall in price of only \$1.50 per hundredweight. This rate of increase in shipments for the critical 10-week period was slightly above normal. However, the rate of decline in hog prices for the same period was slower than normal.

The 1955-56 meat campaigns demonstrated conclusively that farmers and organized food retailers, by working together, frequently can solve problems of mutual interest in a manner assuring each of them maximum freedom of initiative and maximum freedom to adjust to changing economic conditions. The solving of critical market supply problems within the framework of the free enterprise system rather than through the medium of Government stockpiles prevents the accumulation of burdensome supplies which hold prices down and prevent desirable adjustments in production. The experience of 1955-56 shows that producers are willing to adjust production when helped to overcome difficult marketing problems, when given the necessary information, and when allowed to retain desirable freedom of action.

The 1955-56 livestock and meat marketing crisis was met by the combined efforts of all members of the meat team--producers, packers, and retailers. I have discussed the promotion activities of NAFC members because they were most apparent and near to us. Other organizations with active meat promotional programs such as the National Live Stock and Meat Board, the American Meat Institute, the American Farm Bureau Federation and a number of state Farm Bureaus, the National Grange, the U. S. Department of Agriculture through its publicity channels and Plentiful Foods Program, and many State departments of agriculture, all helped to achieve the desirable results which were observed.

The Farmer-Retailer Marketing Program has been in existence for about 20 years. During that time over 350 campaigns and promotions have been conducted covering almost every agricultural food product. The participating organizations--the National Association of Food Chains, the National Association of Retail Grocers, the American Farm Bureau Federation, the Grange, and the Co-Op Council--recently revised and renewed the program, and a statement of policies and procedures guiding it has been published. We have already sent, or will send in the near future, a copy to your office. I hope you will read this statement carefully so that questions from farm organizations and others in your State relating to this program can be answered correctly to achieve maximum usefulness of this cooperative effort.

I would like now to review some examples of promotion of farm products by other groups. One prominent farm organization leader recently defined successful promotion by a commodity organization or a farm group as one which meets the marketing challenge. That challenge means producing and marketing the product in such a way that it is available in 4 dimensions--that of time (year-round availability), that of space (marketing distribution), that of form (many forms of the product), and that of convenience (with "built-in maid service"). Only the closest and most carefully developed cooperation of all segments working in a free market environment can achieve the success which has been reached in this field.

Usually, successful long-range promotions of the kind we have observed for citrus products, turkeys, potatoes, and dairy products are the result of combined efforts of the producers of the product who have adjusted their production techniques to the new market demand; of processors who have packaged, frozen, stored, or otherwise handled the product in a different way; of the food retailers who have carried, displayed, packaged, and advertised the product so that it was convenient for consumers to get it; and of the efforts of government, both Federal and State, which cooperated with all agencies in research work that led to changes in production and processing and distribution technology and to consumer education about the product to increase its acceptability. Of course, I'm aware that Federal and State legislation in the field of supply control and quality control have helped the efforts on some of these products such as citrus, but usually good promotion arises out of competitive freedom of all markets.

One example of long-time successful promotion of an agricultural product is found in the turkey industry. The turkey industry is meeting the marketing challenge and as a result is receiving wider consumer acceptance and increased per capita consumption of its product. In order to attract consumption by small families, turkey growers raised the Beltsville White and other small birds to meet this demand. When consumers required more convenience and labor-saving in their kitchens, turkey processors introduced the frozen turkey pie. In order to achieve wider year-round geographic distribution, turkey producers and processors have shifted from a fresh to a frozen product, and the food retailers, with more refrigerated meat cases, with more sanitary and better lighted displays and with self-service, promoted turkeys to consumers during all months of the year.

You will see from these comments what is meant by increasing the value of the product to consumers.

By looking around the agricultural economy, we could cite many other examples of products which are losing their markets because of failure to adjust to the broad economic and social trends of the country.

It is this type of producer-sponsored promotion activities which food chain companies can appreciate and cooperate with, because it contributes to greater volume. The competitive battle among retailers is for volume of business. An increase in volume is the retailer's method of offsetting rising costs. Retailers operate on the principle that "If you work on the gross, the net will take care of itself."

Another type of promotion, of which you see many examples, is that conducted by food processors and wholesalers. This group includes the meat packers, frozen food packers, fruit and vegetable canners, bakers, dairy manufacturers, and other food processors not associated with either producers or retailers. They are very important in promoting certain specific products and usually place considerable emphasis on one brand. They are anxious to cooperate with producers in getting consumer acceptance of foods because they need increased volume the same as retailers.

An example of successful cooperation between producers and food processors is in the Western Ranch Dinner promotion. Although this promotion is only three years old, it has offered a unique dish to housewives and has attracted wide attention (cooperating products--broilers, cling peaches, biscuits, and evaporated milk).

Another type of cooperative producer-distributor promotion which is successful at the educational level is that conducted by organizations such as the American Dairy Association, the Poultry and Egg National Board, and the National Live Stock and Meat Board. Food chains cooperate closely with these organizations in their sponsorship of special promotion events such as June Dairy Month, Mid-Summer Turkey Time, and others.

Promotional activities of the kind I have described are all costly. When conducted by processors and distributors of farm products, they become part of the costs of marketing farm products--they become part of the price spread. Promotional efforts can be justified as an addition to the price spread when they make a contribution to better nutrition, when they make a contribution to the efficiency of the marketing system, and thereby contribute to raising farm income.

THE WISCONSIN CHEESE PROMOTION PROGRAM

Donald E. Wilkinson
Wisconsin Department of Agriculture

Wisconsin is nationally recognized as being "America's Dairyland." Perhaps outstanding on its list of dairy products is cheese. This reputation has not developed accidentally. On the contrary, three definite factors have been important: (1) Volume production, (2) quality product, and (3) promotion.

The promotion program, authorized originally by the 1935 State legislature, has been administered by the Wisconsin department of agriculture. In recent years this program has been integrated as a specific marketing function of the division of markets. The farm product promotion section, consisting of five people trained in promotion, publicity, and merchandising techniques, works closely with each of the commodity sections as their respective products receive promotion attention. A year-round schedule of product promotion is maintained, with emphasis on products in an emergency marketing situation or receiving national promotion.

Funds for this market-expansion type of work come from four sources: (1) General appropriation, (2) specific appropriation for State matching funds, (3) Federal matching funds, and (4) industry.

This presentation is on just one phase of the promotion work--the out-of-State Wisconsin cheese campaigns.

The U.S. production of cheese annually is about 1,170,000,000 pounds. Of this amount, Wisconsin produces annually about 600,000,000 pounds, or approximately 50 percent. Wisconsin's population of $3\frac{1}{2}$ million, consuming the average of 8 pounds per person, could use annually only 28 to 30 million pounds, or 5 percent of the State's production. The remaining 95 percent must be marketed nationally.

Complicating the situation is the recent transition to prepackaging. In the past the original bulk styles would often carry the State grades and identification to the retail level and to the consumer. Prepackaging by assemblers or other parties in the marketing channel has tended to eliminate the State identification. Promotional efforts now are designed to retain identification on the retail price stickers, in brand identification, and in retail merchandising and advertising.

To accomplish this end, the "Wisconsin Cheese Week" campaigns have been developed, and emphasis is directed to five areas:

1. Industry cheesemakers, assemblers, and processors within Wisconsin are interviewed to determine desirable markets for future promotions. These suppliers are requested to contact the handlers of their products in the selected markets. Tie-in brand identification and aggressive merchandising are encouraged.

Approximately 6 weeks prior to the campaign, these handlers in the markets are contacted by the department's representatives. Detailed information is given, display material orders are taken, and a complete follow-through to the retail level is assured.

2. The second emphasis is placed on the nutritional approach. Prior to the campaign, well-developed recipe booklets are prepared, as well as food releases. One of the department's nutritionists supplies this material to food editors and radio and television home economists.

A luncheon with the key people usually marks the entrance of the nutritionist in the market. This is then followed by a series of radio and television guest appearances, with new uses for cheese and the merits of Wisconsin's cheese being stressed. Programs also are conducted for other groups such as women's organizations, civic clubs, etc.

3. As complete a publicity program as possible announces "Wisconsin Cheese Week" to the public. Alice in Dairyland, the department's full-time promotion girl selected annually, makes gift cheese presentations to State and city officials. She also maintains a heavy schedule of guest appearances of all types.

4. Commercial advertising is used conservatively in newspapers and on radio and television, depending on market circumstances. Where existing advertising is already being sponsored by participating industry and retail groups, tie-in advertising is encouraged.

5. Retail merchandising has come to be the most important single segment of these promotions. On this level the sale is made. Point-of-sale material has been supplied in advance as ordered by industry and retail representatives. Distribution is handled by these parties.

Demonstrators, also requested in advance, are trained by the department nutritionist. They are supplied with neat red and white uniforms and are made available to the selected supermarkets to pass out samples of the Wisconsin cheese of their choosing. Store displays are frequently built by the cheese supplier or the retail store.

The big sales effort takes place at retail on Thursday, Friday, and Saturday of the "Cheese Week." Displays are frequently carried over for the following week.

At the conclusion of the campaign, sales reports are requested. These confidential reports enable an accurate measurement of the campaign. Frequently follow-up reports are requested to determine the level of cheese sales some time after the promotion.

From January through November 1956, 25 campaigns were conducted in 16 States. Composite sales results to date indicate an average of 50 percent more cheese sold during the Wisconsin Cheese Week than in the preceding week in the respective markets.

Requests from industry and retail groups for these promotions are being received by the department far in excess of what funds and personnel will permit. It is hoped that with continued State and Federal support and expanded industry financial participation, this marketing program will be expanded and that consumers throughout the Nation will continue to demand and enjoy high-quality Wisconsin cheese.

EXPANDING MARKETS FOR MAINE POTATOES

William P. Charron
Maine Department of Agriculture

The Maine department of agriculture has a program which is very effective at expanding the markets for Maine potatoes. We are very pleased to have been given the opportunity to tell you about this program. The best method to get this story across is to tell you about last season's work, our plans for this season, and how a market service man on potatoes operates in a market.

At the beginning of the 1955-56 potato marketing season, the department had seven marketing specialists available to do market service and promotional work in out-of-State markets. These men are skilled in their trade, they know Maine potatoes, and they know their potato markets.

We had a real good program to present to the trade. First of all, there was our marketing agreement; our premium packs bearing the State of Maine trade-mark--Maine Mediums, Super Spuds, and Chef's Specials--and ample amounts of fine point-of-sale material. In addition, a large number of Maine shippers were ready to wash their product, size it correctly, and package it in visible containers bearing the State trade-mark. These items were ammunition to use in contacts with produce merchandisers, buyers, wholesalers, retailers, and food editors.

In early October, the marketing specialists went on the road carrying samples of point-of-sale material; sample packs of Maine Mediums; and plenty of information about Maine potatoes, Maine potatomen, and the State of Maine. The trade was receptive. They liked the sample pack of Maine Mediums, they liked the point-of-sale material, and best of all they enjoyed a personal contact with a representative of the Maine potato industry. The information they acquired from this personal contact encouraged and gave dealers more confidence in the Maine deal.

By the end of October, Maine potatoes appeared in most of our markets. Wherever the marketing men worked, shipments increased, and orders were repeated. Of course, the picture was not always rosy. Some poor cars were received. However, in most cases, our men were in the particular market and were able to make arrangements to alleviate the situation. In other words, we tried to keep the trade in all markets happy with good Maine potatoes.

Throughout the season, this work was carried on in 98 cities, located in 20 States. A total of 432,000 pieces of point-of-sale material were distributed. This material was not sent at random, but samples were shown merchandisers and buyers, who in turn picked out the pieces they believed their stores would use efficiently. This method of distribution gave assurance that the material was being used at the retail level instead of lying around in a dealer's warehouse. The point-of-sale material is paid for and supplied by the Maine Potato Commission.

On several occasions, the department received invitations to set up exhibits and displays at the grand openings of supermarkets. At every opportunity the department took advantage of these offers. Our men set up displays of washed and sized Maine potatoes, staffed the exhibit, gave out Maine potato cookbooks, and talked with customers. These direct contacts with housewives in different areas are good. The housewife pays the bill, and many times gives us good, sound ideas to bring back home.

Last season some of our marketing specialists made appearances on radio and television as special guests of food editors of newspapers, radio, and television. Bags of Maine potatoes and a supply of Maine potato cookbooks were given to these food editors so that they could offer them to their readers and viewers. Thus, much free publicity for the product is acquired. An opportunity to appear on television is never passed up by our specialists. They always bring along Maine potatoes and make sure they are before the camera at all times.

Many new markets in the Southern States were visited last year. Our men were well received and have been asked to return. Already these newly acquired customers have begun using Maine potatoes this season.

Our program for the 1956-57 marketing season is well under way. The marketing specialists are out in the markets. In a 2-week period they have worked in 20 cities in 8 States. Markets in which buyers have been stimulated by personal contacts with our men have ordered and received Maine potatoes earlier than usual.

This season's plans are to work in the major potato markets with the same ammunition as last year, and to expand to the South, where good results were attained last year. It was found that people there eat lots of potatoes and like Maine Russets. It is the belief that they will like our consumer-type packages, too.

Some of our point-of-sale material has been redesigned so that it may be used on hangers, as well as on walls. One new piece featuring Maine lobster and Maine french fried potatoes has been added to the line. A brand new slogan, "The MAINE Difference is Flavor," also is being used for the first time this season.

In addition to this market service work, our men also attend hotel and restaurant conventions, the United Fresh Fruit and Vegetable Association conventions, and other expositions, where they set up exhibits of Maine potatoes and staff them. Many valuable contacts are acquired in this manner.

The program, in general, is built around market service and promotional work. The very best program in the world, however, would not be effective without good trained personnel. Men capable of doing this work are hard to find. A good source is the Federal-State Inspection Service. Some of its men already know the product well, and if they are able to meet the public well, they usually are capable of filling our needs.

A marketing specialist out in the markets operates in this manner: At the outset, when he arrives in a given city, he visits the produce terminal and observes the flow of potatoes--our competitors' product, as well as ours. He observes the condition in which they arrive, the handling methods, competitors' products in comparison with ours, packages used, and the movement of the product.

After having made these observations, he is in a position to begin calling on brokers, buyers, and merchandisers, and is able to advise them about certain grades, varieties, or conditions that may be occurring in Maine potatoes. When the occasion arises, and it frequently does, he offers his services to these people. It may be that a store manager is not displaying the product properly and sales are slow. Our man visits the store and shows the manager how to set up an attractive display, using our point-of-sale material. He also visits food editors of the local radio and television stations and newspapers, and gives them potatoes, cookbooks, and information about our product in the local market.

Information on any cars of Maine potatoes in trouble is relayed to the shipper as quickly as possible. In this way, the situation is cleared up in a short time. The receiver likes fast action, and usually repeats his order right away.

Upon his return to the home base in Augusta, the marketing specialist makes out complete reports of his contacts and his observations of what is happening in the markets. This valuable information is carefully disseminated throughout the Maine potato industry. It also is used in a column entitled, "Reports from the Men in the Field," which appears in the Maine Potato Councillor, a newspaper printed by the Maine Potato Council. Our potatomen read this column regularly and use the information.

Our last report to the industry closed in this way: "Remember fellows-- 'The MAINE Difference is Flavor,' but you must ship quality to make an impression in the markets. Receivers of Maines are looking your product over carefully. Give them quality--make them repeat."

This is our method of operation. We work hard. We are proud of our work and its results. It is our hope that this presentation has been interesting to all of you, and that you may be able to adapt some of our methods to your own programs.

ORGANIZING STATE AND LOCAL AGENCIES AND MARKETING FIRMS
IN CARRYING OUT AN INTEGRATED PROMOTION PROGRAM

Raymond B. Wilson
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The impressive title given my discussion boils down to this: "Getting Together and Promoting a Marketing Program." I shall discuss the methods used by the Indiana people in promoting a marketing program.

Expanding market outlets is a big job requiring many avenues of attack, but I shall discuss only those things that have been done jointly by Purdue University and the Indiana Farmer-Retailer Committee. I will exclude the big expansion that has taken place in Purdue's extension, research, and service programs with which the Farmer-Retailer Committee has not been directly concerned.

We all know what Purdue University is, but what is the Indiana Farmer-Retailer Committee? It is a Statewide marketing committee that was formed to help meet the challenge of more orderly marketing of Indiana farm food products. It is guiding a new marketing project at Purdue, and is composed of representatives of food production industries, marketing agencies and Purdue staff members. It has been in operation for over 2 years, and its members are leaders of such groups as the Indiana Restaurant Association, Indiana Farm Bureau, Indiana Retail Grocers and Meat Dealers Association, Indiana Agricultural Extension Service, Indiana Chain Council, and Indiana Commercial Pork Producers Association. It is helping expand market outlets by encouraging production and marketing of better commodities, by distributing marketing information to the trade and consumers, and by conducting integrated promotional programs for individual commodities. What have been the major activities and results of the Farmer-Retailer Committee and Purdue getting together and promoting a marketing program?

Quality program developed. It is hard to sell any product unless it is what is wanted. The consumer is still Queen in the food business, even if she is a limited monarch who is pushed and pulled by advertising and other forces, and her desires must be considered. To sell to best advantage, several requirements are needed such as adequate volume, standardized products, and proper packaging. Marketing of some Indiana agricultural products is behind the times, and small, scattered lots of non-uniform, low-quality products in undesirable packages are keeping many Indiana producers behind the times. To help expand market outlets, a Statewide quality program for Indiana agricultural commodities has been developed. Under this program, producers and handlers of products meeting specific requirements will be granted use of a "Hoosier Seal of Quality" that will identify top quality products. This program, if properly supported, will enable small producers and processors to compete more effectively with products from other States. It will enable the food trade and consumers to buy with the assurance of obtaining uniform, high-quality Indiana products, and will provide products in volume. It also will provide a ready means of identification and promotion in this day of brand advertising. Representatives of the horticulture department at Purdue, State Poultry Association, Chain Store Council, Independent Grocers, Indiana Cannery Association, and others have been active in the development of this program. The new Governor is stressing such a program and the one developed by the Farmer-Retailer Committee will be considered by the legislature in January. The Indiana State Poultry Association, Indiana Farm Bureau, and other groups are backing it.

New market facilities are being considered. A place to sell products is often vital. The Farmer-Retailer Committee is assisting members of Purdue's Horticulture Department in preliminary work concerning the desirability of establishing a farmers' assembly market for fruits and vegetables in the Vincennes, Ind., area. The Michigan City chamber of commerce (near Chicago) also is considering a farmers' market. Further assistance will be given to help determine the need for such markets.

Consumer information program being expanded. It is not enough to say, "Buy a commodity because it is cheap." Consumers need information on seasonality, selection, care, and use of commodities. Studies have shown that food literacy of consumers is not what we would like it to be. To help the situation, an expanded Indiana consumer food marketing information program has been outlined. It is being encouraged by the Farmer-Retailer Committee, and is established at Purdue University. Consumer food marketing agents are being employed in major Indiana cities as qualified personnel is obtained. Consumer agents are now in Indianapolis, Fort Wayne, and Terre Haute. Positions have been budgeted for an agricultural economist and a home economist, to be located at Purdue, to supply information to consumer agents, home agents, and others, and to train the agents in the field. It is difficult to evaluate the consumer information program since it is in the formative stage and expanding rapidly.

A consumer food marketing radio tape service has been established. It is well received and is growing.

Marketing clinic for management personnel developed. A clinic for management personnel of meat packers, canning factories, livestock markets, grain elevators, dairy plants, poultry processing plants, and possibly other marketing firms has been outlined and will be held at Purdue, February 6, 1957. The theme of this clinic will be "Expanding Markets."

An Indiana Farmer-Retailer Committee subcommittee and Purdue staff members have indicated the need and desire for such a clinic, and have worked together to develop it. The clinic, as planned, will provide a place for agricultural marketing leaders and others to discuss and analyze marketing problems and receive the latest information on marketing. It will be divided into general and commodity or industry sessions. Marketing topics of general interest will be presented at the general sessions treating the theme of the conference, and specific commodity or industry problems will be treated at separate sessions. Recognized leaders will be featured in these sessions, which will include discussion and analysis of problems, presentation of research results, and other marketing information.

Coordinated informational campaigns conducted. Consumers lack information about availability, nutritional values and uses of different food products. One of the activities of the Indiana Farmer-Retailer Committee, in cooperation with Purdue, has been to conduct coordinated informational and promotional programs to assist in moving plentiful commodities through trade channels. Campaigns were undertaken during the past year for pork, broilers, dairy products, peaches, and apples.

An industry anticipating marketing difficulty due to a large supply requests assistance from the Farmer-Retailer Committee. If assistance is given, the campaign is planned with the group concerned. Cooperation of Purdue departments and specialists is obtained. News stories and radio tapes are prepared and given Statewide distribution through the Purdue Information Service. The news stories go to 52 newspapers and radio stations, 77 home agents, and 3 consumer agents, and the radio tapes go to 14 radio stations, giving Statewide coverage.

Notices of the campaign and material such as recipes and cooking suggestions are sent to newspaper, radio, and television representatives, and at time kick-off dinners are given for newspaper food editors, radio and television program directors, and home economists. Wide use is made of material from the Poultry and Egg National Board, National Livestock and Meat Board, and similar organizations. Independent and chain grocers, restaurant operators, and plant and institutional feeders are alerted by special mailings. County agricultural agents, home demonstration agents, and consumer agents are alerted and supplied with materials. Newspaper, radio, and television specialists, consumer and home agents, and others cooperate extensively. The industry requesting assistance participates in the campaign and is given material to distribute. Some major retailers sit on the Farmer-Retailer Committee and provide valuable assistance by featuring the commodity in special sales. Publications such as the Indiana Farmers Guide, Hoosier Farmer, The Indiana Food Merchant, and others feature the commodities.

Results of these campaigns are almost impossible to determine, but are indicated by some examples of increased sales. During a pork campaign, a major grocery chain, which is active on the Farmer-Retailer Committee, reported a 68-percent increase in pork sales in an Indiana branch. This is much larger than the increase shown elsewhere in the organization and in the Nation during the same period. It is believed to be partially from their participation in activities of the Indiana Farmer-Retailer Committee. Posters, special ads, and bulk displays, were put to use to stimulate sales.

Expanding market outlets needs many lines of attack. Expanding market outlets is a tremendous job. It is being attacked in Indiana by attempting to improve the quality of products produced and marketed. The quality program outlined above, with uniform quality products, inspection, and a States seal of quality, are examples of work in this area. Alerting consumers about what is on the market and teaching them, through an expanded consumer food marketing program, how to select, care for, and use products is another example of Hoosier work to expand market outlets. And not to be overlooked are the special integrated promotional programs to help commodities through channels. These are some of the ways we in Indiana are attempting to meet the marketing challenge.

THE MATCHING FUND MARKETING SERVICE PROGRAM--
QUESTIONS AND ANSWERS

(These are questions asked by State marketing specialists and answered by Federal personnel at a general meeting of those attending the workshop.)

1. For what purposes may funds from the matching-fund program be used?

This question is one that cannot be answered completely in any brief statement. The funds may be used for carrying on any marketing service project that has been developed, submitted, and approved by both a State department of agriculture and the U.S. Department of Agriculture. In other words, a State may develop a marketing service project on any subject that it sees fit. If it is felt that the subject covers a line of work that is particularly needed, if a plan of work and the approximate costs are outlined, and if the State secretary or commissioner of agriculture approves it and sends it to us in USDA for approval and we approve it, the money may be expended for carrying on that project.

There are certain kinds of projects that the U.S. Department of Agriculture cannot approve. For example, a project to carry on regulatory work cannot be financed from these funds because such work is expected to be financed from its own appropriation.

Second, the U.S. Department of Agriculture cannot approve, from the Federal point of view, a project for carrying on a regular market news service. The reason is apparent. There is an item in our appropriation bill entitled, "Market News Service." However, some States, are not quite sure how to go about getting a market news program under way. In those cases, the project can be financed with matched funds on a 2-year experimental basis. At the end of that time, the work has to be taken over under the regular market news fund. The USDA does have a little leeway. Suppose that a State project has run 2 years, and that the State has an item in its appropriation to put this work on a regular basis. However, the 2-year period will be up before the appropriation can come through. In such a case, the work is not discontinued. Instead, the experimental period is extended for, say, 90 days. At the end of that time, if the State does not have funds to take it over, it must be dropped. But it passes from the matched-fund program after the experimental period is up. Where a State is transferring the work from one commodity to another, the 2-year limit applies to each commodity.

A third type of activity for which the law prohibits the use of funds is payment for advertising--the payment for television or radio time and newspaper or periodical space. The law does not prohibit the printing of publications by a State department, nor does it prohibit State employees from spending official time in writing a television program or a radio script, or buying a bus ticket or other transportation to the station, to put on that program. The provision is that the State cannot make the actual payment for radio or television time or newspaper space from matched funds. After a project is approved, the same restrictions apply to the State half of the fund as to the Federal half. It is a joint project. The funds are commingled, and all are subject to the limitations. State and Federal officials mutually are bound by Federal law and cooperative agreement to spend all matched funds on the approved project and on nothing else.

2. Would there be any objection to using regulatory funds for the State's portion of matched funds, provided all the funds are used for marketing service work?

The transfer of State funds to the matched-fund program from another program does not violate any of our laws. The problem within the State is whether it can divert funds from one project to another. The USDA does not care what the source of the funds is. Regardless of the source, if the funds come under the matched-fund program, they have to be administered under the direction of the State department of agriculture or its equivalent in the State concerned. USDA cannot match funds with any industry group in a State. The State may get its funds from industry, but it must have control over the funds and over the employees who are paid from them. The USDA looks to the State for this responsibility.

The law states that any funds that a State puts into a matching-fund project must be in addition to funds that it had available for that kind of work in 1946. The idea is simple. The Federal Government, when this Act was passed, was attempting to broaden the service work in the States. Although the Federal Government was willing to pay half the cost, it wanted to make sure that it was all for additional work.

3. Can the funds be used to purchase automobiles for people engaged in marketing service work?

The purchase of automobiles and equipment has been permitted, but the practice of having a large portion of any project funds in automobiles, equipment, supplies, etc. is frowned upon. If a State needs an unusual item of equipment, the final disposition of this equipment to be made after the project is terminated will be outlined in the project statement or the financial budget submitted by the State.

4. What is expected of the States in the way of annual reports?

There are essentially two documents, other than fiscal documents, that are needed from the States each year:

(1) At the beginning of the year, when the States request funds, USDA needs a statement of what the State plans to do with the funds. Obviously, this information is necessary in order to decide how to allocate the money.

(2) At the end of the year, USDA needs a report on the work that the States carried on with the funds. This report is due by October 1. These State reports are very valuable to USDA and, if properly prepared, to the States, too, since they have to use that information to get their half of the funds to carry on the program. The USDA uses these reports to support budget requests and to present the program to advisory committees. Therefore, it is important to have in that report for each project:

- (a) What the State did.
- (b) What good it did.

The reports also may contain information on how the States went about the work. USDA uses these reports in presenting a summary of the work carried on by the States at a series of meetings of industry advisory committees established to review the marketing program--the research, service, and educational work. The State people are not there when those committees meet. USDA personnel appear as their proxy to tell the committees what the States did with the money. The statements can be only as good as the reports from the States. If the committees make recommendations against any of the programs, Congress may not approve the work. State officials should bear in mind that USDA must present something worthwhile in about the first three sentences before advisory or appropriation committees. The material used in support of the appropriation committees is taken from the State reports.

Finally, USDA prepares an annual summary of the work done in the cooperating States and distributes it to the States for use as a reference book. For instance, if a State is to start a new project, it can refer to the annual progress report to see if there already may be work of a similar nature in another State. If so, then the State planning the new project can write USDA for additional information on the project.

5. In what way are projects and lines of work approved?

When projects are submitted by States for approval, what criteria are used by USDA in approving them and in allocating funds? Unfortunately, there is not enough money available to approve all the projects submitted. For the better projects, the first criterion is the recommendation of the Advisory Committee on Cooperative Work under the Agricultural Marketing Act. The committee has placed priorities on different fields of work as follows:

(1) Reducing marketing costs. Whenever a project comes in showing firms how to reduce some cost of marketing, that project receives first priority. Therefore, this whole workshop has been devoted to the reduction of marketing costs.

(2) Expanding market outlets.

(3) Maintaining quality of products as they move through the marketing system.

(4) Improving wholesaling and retailing operations.

(5) Statistical work.

When the committee set up this order of priority, it was not its intent to say that statistical work is less important than other work. The priorities were so set up because the program of work is much more advanced in some fields than in others. So current emphasis is in the order given above.

USDA checks with industry committees to see if they have anything to add to the project. However, if the State is not equipped to carry on the type of work covered by the proposed project, then there is not much need to approve it.

CONCLUDING REMARKS

William C. Crow, Liaison Officer
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The people who prepared these reports are to be commended for keeping them brief and to the point. They covered the subjects that they were requested to handle, and they did it briefly.

We should not conclude this workshop without expressing our appreciation to all who have contributed in such a fine way to its success. Our thanks should go first to Dave Foreman and Bob Harris for the wonderful job they have done in taking care of the arrangements here at the hotel, and of projectors, screens, the banquet, entertainment, and everything else that could be done for our comfort and pleasure. I would also like to thank the speakers and the chairmen of our general sessions for the fine job that they did in laying the basic groundwork for our discussion periods. The talks were exceptionally good, and the chairmen did an excellent job of getting things done on time and in order. I would like, too, to express our appreciation to the members of our advisory committee--and we have a wonderful advisory committee. They are always in there pitching when they are needed.

I want to express our appreciation to the chairmen and secretaries of our work groups for the fine work that they did, and I can't pass this opportunity to thank my colleagues from the U. S. Department of Agriculture in Washington who came to help us with our program. I also want to thank our program committee --George Chick, John Winfield, and Don Wilkinson--who worked hard with Leighton Foster, Bob Callaway, and Ed Collins in preparing a program that would be of interest to all the States. I want to express our appreciation to the staff of the hotel who did so much for our comfort.

One other group deserves thanks. The very principle of a workshop is that everybody is a teacher and everybody is a student. Everyone, from that point of view, has helped put on the workshop, and each of you should be commended for your contribution.

I would like to announce that the Advisory Committee has decided that another workshop should be held about this time next fall at some central point in the United States.

I am sure that this has been one of our best workshops. In some respects we have set a new record. A larger number of States have been represented than ever before. We have undoubtedly set a record in the quality of the discussions. They get better every year.

The good that this workshop does will be measured by the effect that it has in your State when you go back home. Unless we can improve our marketing programs by reason of these workshops, they are not worth the effort, and a great deal of effort does go into them. We hope that they meet a real need and that everyone who comes will go back with more enthusiasm about rendering a real service to his State in the field of marketing agricultural products.

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